

Annual Report
of the
Department of Agriculture

FOR THE YEAR ENDED 31ST DECEMBER, 1954

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UGANDA PROTECTORATE

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Department of Agriculture

FOR THE YEAR ENDED 31ST DECEMBER, 1954

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UGANDA PROTECTORATE

DEPARTMENT OF AGRICULTURE

Annual Report

For the year ended 31st December, 1954

I. General Review

By J. G. M. KING, O.B.E., *Director of Agriculture*

FOREWORD

The form of this report follows that adopted in the previous year and departmental activities are reported on an individual provincial basis. As in the previous year this report includes an account of the work of the Special Development Section which is concerned with mechanical cultivation. In addition, a report on the Serere Experiment Station is included. Short précis describing the main activities of the Botany, Chemistry and Entomology sections of the Laboratories Division, prepared by the officers responsible for these sections, are also included. More detailed reports on the research work undertaken by the department will be published at a later date.

WEATHER

Although some areas received amounts of rainfall in excess of the average, distribution particularly during the latter half of the year was unsatisfactory and long dry spells were experienced. Whilst total rainfall at widely separated centres such as Fort Portal and Moroto was well above the average, some lake-shore areas in Mengo and Masaka districts and the Eastern Province in general received considerably less rain than normal.

The main rains were rather late and did not become general until early April. Thereafter adequate rain fell until June when the normal mid-season dry weather set in. Rainfall in July was about normal but was above average in some areas in August. The weather was somewhat drier in September which was followed by severe drought conditions over much of the Protectorate during October and November. Rainfall in December was rather above average and the dry season did not commence until late in the month.

The weather during the spring rains was satisfactory for food crops, although the latter were late planted, and perennial crops also fared well. Cotton, on the other hand, suffered very severely from the very dry autumn and prospects at the end of the year were not very promising.

AFRICAN AGRICULTURE

CROP PRODUCTION

The most notable event of the year concerning agriculture in Uganda was the appointment in June by the Governor in Council of the Agricultural Productivity Committee under the chairmanship of the Secretary for Agriculture and Natural Resources, with the following terms of reference:—

“To prepare for the consideration of the Development Council as part of the Five-Year Development Plan, a programme for raising agrarian productivity and standards of farming in the Protectorate, bearing in mind that the agricultural and livestock industries must primarily be based on peasant production, and to make recommendations as to how the programme should be put into effect.”

This Committee toured the Protectorate very extensively and having met the various District Teams and a number of African farmers produced its report in November containing its recommendations covering both short-term and long-term policy. Further reference to the increased staff needs of the department, as envisaged by this Committee, is made at the end of this section of this report.

Production of food crops was on a satisfactory scale during 1954 and, in general, the depleted food supplies following the indifferent harvest in the previous year were once more built up. The harvests of finger millet and sorghum were well above average and adequate supplies of legumes and root crops were available. In Buganda the quantity of maize, which is largely grown as an economic crop, although considerable, was less than that produced in the previous season. The supply of plantains was far more plentiful than in 1953.

The 1953-54 cotton crop was the second largest crop ever produced in the Protectorate when some 1,600,000 acres were planted and production amounted to 397,631 bales.

The following table gives comparative figures of production over the past eleven seasons:—

TABLE A
COTTON PRODUCTION
1944-1954

Season				Estimated Acreage	Bales of Lint (400 lb.)	Average yield per acre	Average price to growers (100 lb.)
						<i>lb.</i>	<i>Shs. cts.</i>
1943-44	..	..	..	1,233,801	191,452	203	13 18
1944-45	..	..	..	1,072,493	272,567	337	14 83
1945-46	..	..	..	1,145,568	227,544	265	16 40
1946-47	..	..	..	1,253,257	231,745	247	18 45
1947-48	..	..	..	1,036,829	170,066	218	20 42
1948-49	..	..	..	1,555,371	391,240	333	29 61
1949-50	..	..	..	1,628,473	339,788	282	31 75
1950-51	..	..	..	1,535,200	346,465	301	43 16
1951-52	..	..	..	1,514,157	380,304	332	47 56
1952-53	..	..	..	1,472,553	319,992	290	48 60
1953-54	..	..	..	1,611,223	397,631	325	49 40

The prices paid to growers were Sh. 1 per 100 lb. higher than in the previous season, being Shs. 51 per 100 lb. for the variety BP52 and Shs. 50 per 100 lb. for the variety S47. Growers received for this crop a total sum estimated at £12,925,000 and the whole crop was disposed of by the Lint Marketing Board through free market sales in Kampala. The acreage of the 1954-55 crop at over 1,730,000 acres was some 120,000 acres higher than in the previous season and at one time it was anticipated that another large crop would be produced. A severe dry spell in October and November, however, seriously reduced crop prospects and it became apparent towards the end of the year that production would be considerably less than in the 1953-54 season.

Production of the Robusta coffee crop at 25,196 tons clean coffee was at a lower level than in the previous season as the dry conditions during flowering and setting in 1953 adversely affected the crop. However, the prices paid to growers for dried cherry were higher than ever before, being Sh. 1 per lb. at the beginning of the year, Shs. 1/50 per lb. in the middle of the year and Shs. 1/25 per lb. when marketing was resumed after the close season in September and October. The total amount paid to growers was estimated to be nearly £6,900,000. At the end of the year prospects were excellent and it was certain that a record crop would be harvested in 1955.

Production of coffee in Buganda during the past nine years is shown below:—

TABLE B
AFRICAN COFFEE PRODUCTION—BUGANDA

	1946	1947	1948	1949	1950	1951	1952	1953	1954
Cured Coffee (tons) ..	24,449	17,238	31,142	18,351	26,263	34,632	29,563	26,998	25,196

The 1953-54 Bugisu Arabica crop amounting to 3,122 tons parchment coffee was considerably larger than that obtained in the two previous seasons and the cash return to the growers at £1,231,791 was nearly double the figure for 1953. A record crop in 1954-55 is expected and it is anticipated that over 4,500 tons parchment will be produced.

Details of crops for the past eleven seasons are given in the following table.

TABLE C
BUGISU ARABICA COFFEE

Season		Parchment	Estimated Value
		<i>Tons</i>	<i>£</i>
1943-44	..	3,679	105,592
1944-45	..	2,705	73,740
1945-46	..	2,817	97,169
1946-47	..	3,058	107,215
1947-48	..	2,996	121,692
1948-49	..	2,857	173,799
1949-50	..	2,852	184,859
1950-51	..	3,896	442,104
1951-52	..	2,203	377,575
1952-53	..	2,307	633,040
1953-54	..	3,122	1,231,791

Although field work on Bugisu coffee showed some improvement during the year, careless preparation and grading of parchment resulted in a lowering of quality.

There was a reduction in the acreage of fire-cured tobacco in Bunyoro District and production fell back after the increased crop in the previous season. In Mubende the quantity of leaf sold was maintained at the 1953 level. Higher prices for the 1955 crop were announced at the end of the year with a bonus of 6 cents per lb. to the African Local Government, and it is hoped that a recovery in production will result. In the West Nile District, although the acreage of air-cured tobacco was little larger than in 1953, sales of leaf increased substantially as illegal exports to the Sudan were reduced. Whilst production of flue-cured leaf in Acholi and Lango districts was maintained at the 1953 level, there was an increase in production of approximately 20 per cent. in West Nile District. Production during the past two years has been as follows: —

TABLE D
FLUE-CURED TOBACCO PRODUCTION

Area	1953	1954	Green Leaf	
			1953	1954
	<i>acres</i>	<i>acres</i>	<i>lb.</i>	<i>lb.</i>
West Nile ..	1,102	1,503	2,769,554	3,313,995
Acholi ..	625	750	1,368,916	1,366,627
Lango ..	51	84	162,674	177,190
Kigezi* ..	—	48	—	129,000
TOTAL ..	1,778	2,385	4,301,144	4,986,812

*First rains crop only

The acreage of groundnuts in Busoga District was reduced owing to unfavourable weather for planting. The marketable surplus in the Eastern Province was estimated to be of the order of 7,200 tons.

Cottonseed production amounted to 145,000 tons of which 123,000 tons were sold at local auctions at an average price of approximately Shs. 310 per ton. No cottonseed was exported.

The prices paid for castor seed were considerably lower and sales were estimated to be approximately half those of the previous year.

Maize growers took heed of the warning that prices in 1954, with the removal of control, were unlikely to be maintained at their 1953 level, and a smaller acreage was planted. Nevertheless, it is estimated that 800,000 bags were sold in Mengo District. Busoga District delivered approximately 35,000 bags to the Jinja Grain Conditioning Plant.

There was some recovery of the Kigezi flax crop in the 1953-54 season and the acreage planted increased to 506 acres from 358 acres in 1953. Although the cash return per acre was an improvement on the previous season's figure it was still too low to stimulate much interest and the acreage dropped to 470 acres for the 1954/55 crop. It is highly probable that the industry will be closed down when the current crop has been processed and sold.

The Kigezi Vegetable Scheme now has 278 registered growers who received over £6,000 for the vegetables produced by them. Deliveries to Kampala and elsewhere were maintained at two lorry loads per week.

NON-AFRICAN PRODUCTION

Production of Robusta coffee by non-African estates was affected by the unfavourable weather in 1953 and was some 650 tons below that of the previous season. Prices received for coffee during the year more than counterbalanced the loss in yield.

Production during the past seven seasons has been as follows:—

TABLE E
NON-AFRICAN COFFEE PRODUCTION (ROBUSTA)
(*Clean Coffee*)

Season	Tons	Value
		£
1947-48 ..	3,592	281,678
1948-49 ..	2,581	227,247
1949-50 ..	3,060	616,363
1950-51 ..	3,846	940,504
1951-52 ..	4,851	1,425,669
1952-53 ..	5,921	1,846,697
1953-54 ..	5,277	2,100,993

Eight additional tea planting licences covering 1,546 acres were issued during the year, bringing the total licensed acreage at the end of 1954 up to 23,389 acres. Additional plantings during the year amounted to 881 acres giving a total acreage under tea at the end of the year of 9,278 acres. The increase in tea production was maintained. Total production of manufactured tea during 1954 was 6,265,058 lb. which was an increase of one and a half million pounds over that of the previous year.

The total production of the two sugar factories was 40,812 tons which was a decrease of approximately 7,000 tons compared with 1953. Unfavourable weather and the effects of ratoon stunting disease were the causes of this decrease. However, progress has been made with investigations into this disease and the production of disease-free planting material is in hand.

During the year the Masindi Sisal Estates produced a total of 1,200 tons of fibre of all grades.

AGRICULTURAL DEVELOPMENT AND EXTENSION

Emphasis has continued to be placed on the maintenance and improvement of fertility of the agricultural lands of the Protectorate. During the year the greatest progress in soil conservation was made in Buganda where many more miles of contour bunds were constructed by the people themselves under the guidance of departmental staff. The application of organic manure to perennial crops, largely bananas and coffee, is encouraged in all areas and in Buganda Pro-

vince particularly steady progress has been made. An increasing number of coffee growers have spent a proportion of the considerable revenue which they have received from the sale of their crop on transporting coffee husks for application to their land. Agricultural competitions in all districts have induced a healthy rivalry between counties or sub-counties and have been responsible for greater efforts by cultivators.

During the year the increased facilities for agricultural education which are required to meet the growing need in this respect came under review by the Agricultural Productivity Committee and plans for future development were laid. Two main farm institutes will be built initially at Bukalasa and in Teso District respectively and, at a later date, these will be followed by eight minor institutes. The training of potential agricultural staff will be undertaken at the main institutes when they are completed, alongside farmers who will be trained to enable them to return to their own land with a knowledge of the basic principles of agriculture.

The Agricultural Sub-Committee of the Uganda Credit and Savings Bank met 10 times during the year and approved 59 agricultural loans totalling £5,818. At the end of the year there were 546 open agricultural loans out of a total of 1,151. A very high percentage of the agricultural loans was held by Baganda. Unfortunately, the number of defaulters was high and at the end of the year 174 were in default out of the total open agricultural loans of 546.

Tractor contract service units continued to be operated by the department on an investigational basis. A more accurate assessment of the costs of mechanisation became available at the end of 1953 and the rates for tractor hire were increased, particularly in respect of small fields and scattered farms. A survey of African-owned tractors was continued and advice and assistance given to the farmers operating them.

It was necessary to close down Busoga Farms at the end of September. Experience has shown that there was little chance of profits being made in growing the normal crops of the district with full mechanisation which entails expensive supervision. Kigumba Farm operated by the Bunyoro Agricultural Company continued with a full programme of development, but emphasis in future will be on its conversion to a tenant farming scheme. A number of smaller farms operated by the Special Development Section produced much useful knowledge on farming such units with the aid of mechanical cultivation facilities.

INVESTIGATIONS

Brief summaries of the work undertaken by the research staff of the department appear in the main body of this report under the Botany, Chemistry and Entomology sections.

STAFF

The permanent establishment of the department was considerably below full strength throughout the year in spite of the arrival of new appointments. At

the end of the year there were vacancies for five Agricultural Officers and four Field Officers in the Field Section and three specialist officers in the Research Division of the department.

Considerable expansion in the services of the department has been recommended by the Agricultural Productivity Committee and the proposals have subsequently been accepted by Government and by Legislative Council. Thirty-eight new appointments to the department and ten to special development projects have been proposed over the next five-year period.

ACKNOWLEDGEMENTS

Once again I would like to acknowledge the assistance and co-operation which this department has received during the year from both official and unofficial bodies and other departments of Government. My thanks also due to all members of my staff who have displayed their usual energy and enthusiasm throughout the year and who have shouldered loyally the increasingly heavy burdens which the increased *tempo* of work and staff shortages have thrown on them.

This report would not be complete without paying tribute to the fine work done in the Protectorate by Mr. W. J. Mill Irving, O.B.E., late Deputy Director of Agriculture, who retired during the year under review. It will be acknowledged by all who knew him that the Protectorate and the department owe much to him during his twenty-three years' service in the Protectorate.

ENTEBBE,
APRIL, 1955.

J. G. M. KING,
Director of Agriculture.

II. Annual Report—Buganda Province

By W. H. EDWARDS, M.C., *Acting Assistant Director of Agriculture (Field)*

Section A—GENERAL REVIEW

WEATHER

Weather during the first quarter of 1954 was generally unsatisfactory for planting as little rain fell in most districts until the last few days of March. Although scattered showers did occur throughout the province in January and February, these were often ineffective owing to the long hot and dry intervening periods. Masaka and Mubende districts received good well distributed rains during April but in Mengo rains were absent during the first and last weeks of the month. May rains were fairly ample during the first two weeks in Mengo and Masaka but were short and ineffective during the latter half of the month, while in Mubende the May rains were ample and well distributed. June generally was a fairly dry month, especially in Mubende and Masaka. Some good rains were received in Mengo during the early part of June but tailed off very quickly. In July good planting weather was confined to Masaka and Mubende, while in Mengo the long dry intervening periods ended planting.

Rainfall in August, with the exception of localised areas along the lake shores, was most satisfactory throughout the province. September was also a month of well distributed rainfall.

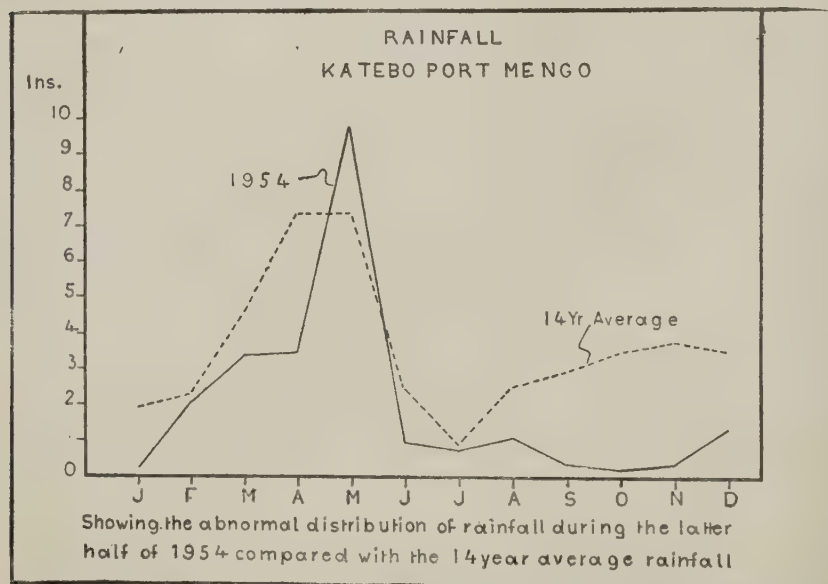


FIG. I

October in Mengo was unusually dry but good rains fell during this month in Masaka and Mubende. November, until the last few days when good rain fell, was rather dry and hot in Mengo and Masaka.

In Mubende, November was rather a cool wet month. Ample rains occurred during the early part of December throughout the province, but the latter half was rather hot and dry with only localised scattered showers and storms. Some hail occurred throughout most of the province during the last quarter of the year. Damage to crops was severe in localised areas.

AFRICAN AGRICULTURE

1954 was indeed a most profitable twelve months for the majority of growers in Buganda. The price for the two main cash crops, cotton and coffee, reached an all-time record. The cash accruing to growers from the sale of these two crops only was over £11,250,000, an increase of nearly £3,000,000 on 1953. Coffee alone contributed over £6,800,000 to this record figure.

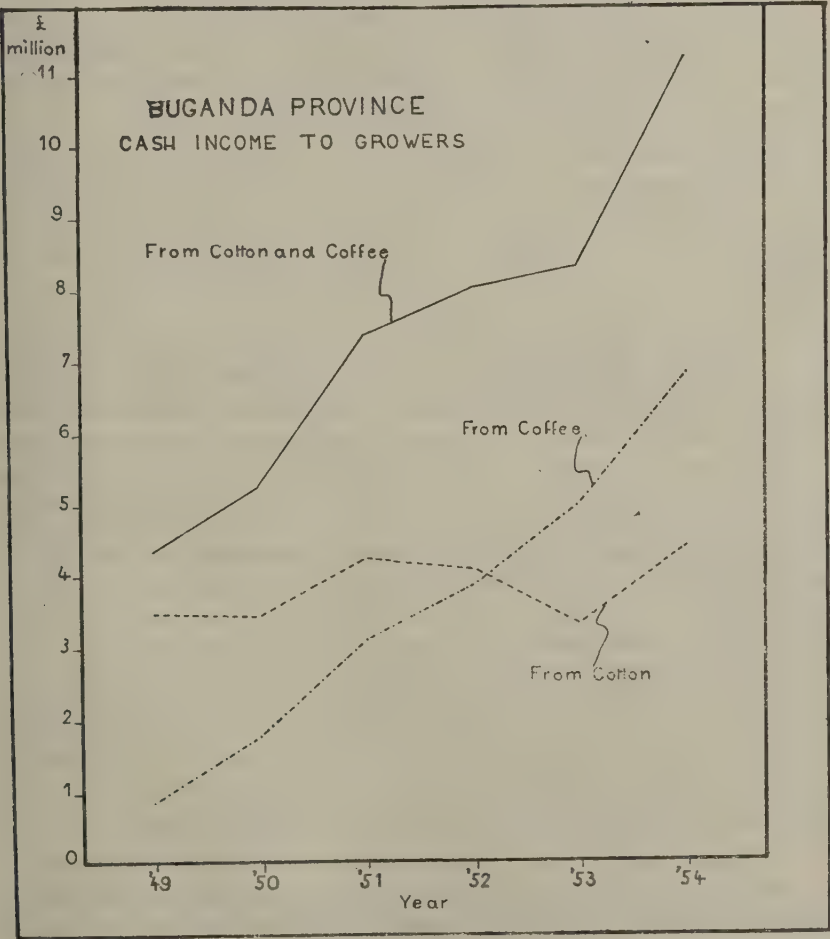


FIG. II

Other minor crops such as maize, mixed beans, groundnuts, castor seed and tobacco also served growers well. The total visible earnings from these were in the region of £1,000,000.

In addition to these recorded visible earnings, many growers received good returns from the internal sale of "matoke", beans and groundnuts, vegetables, pulses, milk and meat. In fact it can be said that the average Muganda small-holder today can and does earn far more per acre than his crofter or smallholder counterpart, certainly in Europe, if not throughout the world.

Food supplies, with the exception of localised areas near the lake shore, were ample throughout the year. The good rains at the end of 1954 promised well for the future. As 1954 came to a close, an all-time record coffee crop was being picked. The price for the crop was the second highest ever and as a result most people were very satisfied and happy.

Co-operative enterprises continued to grow and the leased ginnery at Ngogwe and the two acquired ginneries ginned a total of 9,493 bales. They also operated a new coffee curing works at Masaka and by the end of the year had exported nearly 100 tons of clean coffee. The Co-operative Union marketed 36,000 bags of maize, compared with 75,000 bags in 1953.

Units of the mechanical cultivation section ploughed 1,000 acres in Mengo and 200 acres in Masaka District.

Second ploughing operations amounted to over 1,000 acres throughout the province.

Progress in soil and water conservation and maintenance of fertility continued to make excellent headway throughout and many more miles of tied bunds were added to the existing hundreds in the province. Whilst much progress was achieved in improving general standards of cultivation, the general level of yield can only be raised by more intensive practice, and by more personal supervision of farming operations by the farmer himself. "The farmer's foot is the best manure" could be adopted as a motto with considerable advantage in Buganda.

The increase in the number of corrugated iron roofed houses and motor cars throughout is a clear indication of the prosperity of the province.

NON-AFRICAN AGRICULTURE

Production of sugar in 1954 at Lugazi Sugar Factory was only 20,500 tons, being 5,000 tons less than in 1953. Dry weather was the main reason for poor yields. In 1955 a start is to be made to establish ratoon virus-free sets for planting. These sets will come from Kawanda Research Station and sufficient should be available to plant at least 10 acres in the first instance.

The firm is making great efforts to increase yields by application of fertiliser and last year some 1,400 tons of mixed fertiliser was applied. 1,000 tons of special nitrogen and phosphate and potash (N.P.K.) fertiliser have been ordered for the coming year.

The high prices for coffee and tea have stimulated better and more production of these crops on many estates. During the 1953-54 coffee season, 5,047 tons of clean Robusta and 369 tons of clean Arabica coffee were produced on estates in Buganda. This represents an average yield per acre of 6 cwt. of clean Robusta. New tea estates were established and the production of tea increased during the year.

AGRICULTURAL INDUSTRIES

Under the reorganised cotton industry, 45 ginneries operated in the Mengo-Entebbe zone, 11 in the Singo-Mubende zone and 8 in the Masaka zone. Output of AR and BR bales per ginnery compared with 1953 is as under:—

	1953	1954
Mengo-Entebbe zone ..	1,848	2,406
Singo-Mubende zone ..	1,235	1,764
Masaka zone ..	932	1,095

Rebuilding of most ginneries was well in hand during the year in Mengo; all these ginneries will be in operation by the 1954/55 ginning season. The new ginnery at Nazigo, Bugerere, was completed during February.

A total of 46,000 tons of B.P.52 seed was sold to oil millers in Buganda during 1954. The seed fetched on the average about Shs. 322 per ton and the total cash return from the sale of this seed was some £751,000. It is estimated that 21,000 tons of cotton seed cake and 1,491,000 gallons of oil were produced from the crushing of this seed.

The number of maize mills increased in the province but the total number is unknown. Estates continued to grist maize for their own labour.

Licences for the operation of two more estate coffee factories were issued to African coffee farmers in Mengo.

Under the Coffee Industry Ordinance, provision was made for the operation of six coffee curing works by Africans in the province. Up to the end of 1954 the only one completed was that belonging to the Masaka District Growers' Co-operative Union Limited at Masaka. Foundations for another new curing works at Mityana were laid and it is expected that this will be operating early in 1955. Applicants for the other four have been selected but no building has yet taken place. The existing six coffee curing works and seven hulleries continued to operate satisfactorily in the province.

MARKETING

Cotton marketing started on the 4th January in the Mengo-Entebbe and Mubende-Singo zones and on the 17th January in the Masaka zone, both dates being a fortnight earlier than in 1953. Marketing closed in all zones before the end of March. Rotational marketing again operated in Masaka and Mubende at remote centres which market little cotton. Fair average quality standards of cotton were set during the second week of buying in all zones.

Marketing, except in Bugerere, went smoothly. For the first time in the history of Bugerere a new bridge was established over the Ssezibwa River permitting unrestricted movement of loaded lorries. This, coupled with an unprecedented cotton crop in south Bugerere, led to very unsatisfactory buying in the area due to severe competition from "kyalo" lorries from outside the county. It was virtually impossible to establish any reasonable grade in the area as all unsorted cotton rejected at stores and ginneries found a very ready "kyalo" market. This state of affairs was stopped by cotton buyers, with the full support of the Mengo-Entebbe ginning pool, taking especial care to inspect all cotton before purchase. This had a very salutary effect on the grade and although marketing was somewhat slowed down, it was well worthwhile. This strict examination of cotton before purchase resulted in more "fifi" bales being produced in the Mengo-Entebbe pool than ever before.

Marketing of coffee at primary markets, hulleries and curing works proceeded smoothly. Arrivals of "kiboko" coffee at markets, hulleries and curing works was particularly heavy during December and many hulleries were approaching their quota by the end of that month. Marketing was closed for some six weeks from the 13th September to 23rd October to allow for stock-taking and price adjustment.

Quality of the coffee marketed was fair only; a sharp drop in quality occurred prior to the closure of marketing as a result of indiscriminate picking caused by fears of a falling price. Drying was well carried out, being done mainly on mats, reed tables and cement floors. The flow of coffee from Masaka to Bukoba ceased when prices in Uganda strengthened.

Coffee primary marketing was virtually freed during the latter half of the year. Applications were invited for the establishment of new coffee buying centres throughout the province, the only restriction being that no new centres could be built within two miles of existing markets. This brought a spate of applications from intending buyers but owing to the difficulty of selecting and pin-pointing the new centres none was gazetted in 1954. It is expected, however, that in 1955 all new centres will be operating.

November saw the opening of the Kampala Coffee Exchange, a milestone in the history of Buganda coffee. Auctioning of coffee at the Exchange has so far been confined to native Robusta and Arabica only. Up to the end of 1954, a total of 5,580 tons of Robusta coffee had been auctioned on the Kampala Coffee Exchange.

It is estimated that a total of some 800,000 bags of maize for sale locally and for export were produced in the province during 1954. Marketing of this produce was decontrolled and as a result started earlier than usual and was virtually completed by the end of October. In spite of a large crop, the marketing proceeded much more smoothly than in 1953 and there was little congestion in evidence at stores. Growers in Mengo received on the average between 8 and 9 cents per pound for the crop.

Tobacco marketing in Mubende started on the 25th October and was completed by the 19th November. Purchase of the crop was in the hands of two buyers who handled the marketing most efficiently and expeditiously. 76,977 pounds of all grades was marketed co-operatively by some 23 societies. All received a bonus of Sh. 1 and cents 90 per 100 pounds for Grade I and Grade II respectively.

All primary produce, with the exception of cotton, tobacco and coffee, was decontrolled by July. Prices to growers of most produce have been maintained at a satisfactory level during the year. The opening of the Kampala Produce Exchange in February has no doubt helped prices, as merchants, dealers and growers are well supplied with up-to-the-moment prices through the Exchange.

SOIL AND WATER CONSERVATION

Propaganda by all field staff in the encouragement of soil and water conservation methods was actively pursued throughout the province during 1954 and generally excellent progress was made especially in Mengo and to a lesser degree in Mubende. Although some very good work has been done by individuals and localised areas in Masaka, the campaign to save the soil in this district has not as yet gathered the same momentum or reached the magnitude as it has in Mengo. Tied bunding is now an accepted integral part of farming in Buganda, especially throughout Mengo. The apparent benefits from bunding in saving the soil and water are so obvious that little further encouragement is now necessary to get chiefs and farmers to adopt this most important work. Paspalum planted tied bunding is done communally or by "bulungi bwansi" throughout most of the province. The detailed field organisation of this work is in the hands of the miruka chiefs, although general policy is first discussed at saza, gombolola and miruka councils. Departmental field staff help in the layout of bunds and in selecting areas most urgently in need of bunding, as well as in the encouragement of the actual work. It would be idle to conjecture in terms of exact miles the extent of bunds in Buganda but it can be safely stated that hundreds of miles of bunds exist throughout the province.

Bunds are normally laid out by eye and are arranged to cut across the slope at parallel intervals varying from 15 to 30 yards according to the gradient. To safeguard against incorrect alignment, the bunds are tied every 10 yards. It is our aim to establish long continuous bunds running through as many holdings as possible and covering as much of the mutalla as is feasible. In many instances, tied bunds run to five miles in length. This method of parallel bunding has been adopted to allow for the ease of entry of mechanical cultivation when necessary and it is hoped in the long run that this will lead to a more systematic layout of plots or "bibanja". Building up of soil behind the bunds giving a terracing effect is now a familiar sight throughout Mengo and had it not been for these bunds the water and soil would have found their way into the swamps. As intensive cultivation becomes more and more necessary, bunds will have to become

part of local agricultural practice if crop yields and soil fertility are to be maintained.

Maintenance of fertility is an integral part of soil conservation and considerable emphasis has been placed on this aspect of the work throughout all our extension work. The use of kraal manure, coffee husks, household and crop residues has spread rapidly during the last few years. Results from the application of kraal manure on coffee and bananas have been most spectacular. Night kraaling of cattle in coffee plots is gaining popularity; not only does this increase crop yields but it also reduces weeding costs. Grazing of resting land under the advocated 3-3 rotation is spreading but very slowly.

In one or two instances in Ngogwe where plantains have been planted after intensive grazing of resting strips, the effect has been astounding. The use of compost in areas near Kampala and Entebbe increased during the year and 410 tons and 1,174 tons were distributed at Entebbe and Kampala respectively, representing a total of 1,584 tons, compared with a total of 733 tons in 1953. Distribution of coffee husks was well carried out in Masaka but in the Kampala area, owing to transport difficulties, hardly any was distributed.

Mulching of plantains with elephant grass, sorghum straw, maize stalks and other grasses is being done more generally throughout. Mulching of coffee is being practised quite extensively in Masaka and Mubende but is not so extensive in Mengo owing to the fear of arson, grass fires and also because of the high cost involved.

Sheet erosion within arable plots was reduced by advocating interplanting of beans, and groundnuts in maize and cotton and the mulching of the cotton crop with maize stalks. Hoeing of weeds into rows cutting across the slopes is also gaining popularity; this is also practised by some coffee growers. These rows serve as extra bunds within the strips. Tied ridging of sweet potatoes as opposed to mounding although encouraged is catching on slowly. Grassing of compounds and protection of run off from eaves of houses by stone-filled gulleys is now a common feature in Mengo. Bodies, such as missions, schools and hospitals, are also taking a keen interest in the grassing and protection of their compounds against run off and sides of most "Luwalo" and "bulungi bwansi" roads have been well protected with *paspalum*.

Africans continue to comment on the lack of soil conservation on non-African estates which has been particularly bad during the opening up operation on some of the new tea estates in the province.

Soil and water conservation, maintenance of soil fertility and grassing of compounds and roads are some of the major targets in our annual extension campaigns. During the annual shield competitions the extent and progress of this important work is judged by distinguished visitors.

A total of 20 new boreholes was sunk in Buganda during 1954, and construction of valley dams started at Mawogola, Masaka.

ANIMAL HUSBANDRY

The Veterinary Department livestock census for 1954 shows the following livestock populations in the province. Figures in thousands to the nearest thousand except for pigs which are in hundreds to the nearest hundred:—

	Cattle	Sheep	Goats	Pigs
Mengo	296	44	201	5.5
Mubende	25	9	58	0.3
Masaka	131	12	60	1.0
TOTALS	452	65	319	6.8

The importance of mixed farming in the farming economy has not yet been fully realised in Buganda. Many farmers possessing cattle do make good use of manure for the coffee and plantains and the milk for food and sale, but very few, however, have fully integrated cattle into their farming system. Grazing of cattle is normally done outside the farm on communal grazing grounds and in swamps. This means a considerable loss of valuable manure and the absence of proper supervision of the cattle.

Some enterprising farmers practise paddocking and simple pasture improvement such as digging out of *Cymbopogon Afronardus* and night paddocking of cattle in weedy coffee, but hardly any practise ley farming in the true sense of the word, although in the Ngogwe areas one or two farmers are moving in that direction. The use of cattle for ploughing, weeding and transport is not practised in Buganda, except by one farmer in Masaka, who has recently tried ox-ploughing. Tethering of cattle near the homestead is being practised on a small scale in parts of Kyagwe. The growing of supplementary starch and protein food crops specifically for livestock is not in any case fully practised. Cattle and young stock are obliged to eke out on crop surplus and residues.

Repatriation of Lango cattle to Buruli continued and the head of cattle in that county is now 15,225 compared with 13,000 in 1953. Cattle were permitted in Bugerere north of Kayunga and west of the road leading to Galiraya during 1954 and by the end of the year 862 head of cattle had been established in the county.

As Buruli is evidently suitable for ox-ploughing, attempts are being made to get the farmers interested in this side with a view to integrating their cattle into the farming system. With this object in view, 20 farmers were sent to Serere from Buruli for training in the breaking in of oxen for ploughing and farm transport generally.

The policy of producing a working herd of cattle at Kamenyamigo, Masaka, continued. Manure from the present herd of 47 cattle is being used extensively on the coffee and plaintain gardens and on sweet potatoes. Most of the food grown on the farm is used for supplementary feeding of the cattle.

At Kakumiro, Mubende, a small herd for demonstration purposes has been started. A cattle kraal and a calf pen have been constructed and the manuring of coffee and bananas started, to show to the local cattle owners the great advantages accruing from kraal manuring crops.

Bukalasa maintained a herd of some 45 head of cattle and a flock of 20 sheep during the year. An average of seven cows were in milk throughout the year. Milking at Bukalasa is done once daily, in the morning, after which the calves are allowed to run with the cows until the evening, when they are taken in. Grazing of the cattle is done mainly on the central farm and in permanent paddocks. Night paddocking of cattle in weedy coffee was also done during the year with excellent results. The manure from the herd is used mainly on coffee, bananas and sweet potatoes. Supplementary feeding consists of food available off the farm.

PASTURE WORK

There is a pressing need for work on pasture improvement throughout the province. Very little attempt has been made by local farmers except a few in the Ngogwe area to improve their grazing. In Ngogwe area one or two farmers have made successful attempts to improve their pasture by paddocking and digging out *Cymbopogon Afronardus* from the grazing areas. Once the *Cymbopogon Afronardus* is removed the better grasses take over.

Grazing generally in areas of heavy cattle populations is degenerating. This is brought about mainly by over-grazing and burning at the wrong time of the year, leading to erosion. Such conditions allow for the rapid encroachment of these areas by *Cymbopogon Afronardus* which thrives under such adverse treatment. *Chloris gayana* continues to be planted at experimental stations but very few farms in the district follow.

Some farmers have established patches of *Paspalum notatum* for grazing and have found it most satisfactory; judging from the number of well grazed bunds one finds in cattle populated areas, the grass appears to be well liked in spite of local propaganda to the contrary.

IRRIGATION

There is no irrigation as such in the province.

AGRICULTURAL EDUCATION AND EXTENSION WORK

Bukalasa, apart from being an experimental farm, is also the main educational centre for the training of instructors and assistant instructors for both Buganda and Western Provinces. In addition, short courses for chiefs, cultivators, prison warders and school teachers are held for most part of the year. In 1954 the following persons completed formal courses at the centre:—

Learners	...	...	...	...	5
Apprentices	...	...	...	...	21
Prison Warders	...	...	...	...	19
School teachers	...	...	...	...	74
Chiefs and Cultivators	...	...	...	...	373
Refresher Courses: Instructors	...	...	...	...	8
Assistant Instructors	...	...	...	...	31
Chiefs (ex Entebbe)	...	...	...	...	28

Total ... 559

A total of 37 weekly courses for chiefs and cultivators from Mengo were arranged at Bukalasa during 1954. Attendance, however, was most disappointing, especially from sazas in East Mengo—the total attendance was only 373 out of a possible 740.

A week's course for 200 local leaders was held under the auspices of the Community Development Officer, at Gomba, Mengo, during November. One day was devoted to agriculture when lectures were given by senior members of Namulonge and the department on agricultural topics. Demonstration plots, previously planted at the centre, were used to drive home the main points covered by the speakers. These leaders will be a great help later in local extension work in the field during campaigns. The courses ended with a very successful and instructive agricultural show. Agricultural shows were also held at Kiboga, Singo, in June and Nakifuma, Kyagwe, in December; both were well attended and most instructive. These shows go a long way to encourage healthy competition between the farmers in the vicinity.

Both the senior and junior field staff of the department toured extensively during the year, visiting, discussing, lecturing and demonstrating. Getting to know and gaining the confidence of growers and chiefs is half the battle in extension work. Newsletters and pamphlets are issued periodically and give force to our propaganda. Chiefs' and cultivators' weekly courses at Bukalasa, community development leaders' course weeks, agricultural shows and films all help in furthering departmental extension work. The Agricultural Adviser, Mengo, gave the department invaluable assistance by enlisting the full support of the Ministers in our endeavours and policy to improve agriculture generally throughout the province.

The success and effectiveness of our extension work in the field is judged by annual competitions. In Mengo these competitions are arranged on a county or saza basis, in Mubende on a district basis, while in Masaka on an individual group and gombolola basis. Targets for the competition are set early in the year and cover all aspects of improved agriculture. In Mengo the following targets were set for the 1954 competition: —

- Soil and water conservation.

- Ridging of sweet potatoes.

- Anti-erosion measures on paths, roads and around the houses.

- Mulching and pruning of banana gardens.

- Control of banana weevil.

- Planting of a sufficiency of food crops such as mosaic resistant cassava, sweet potatoes, groundnuts and local famine crops such as yams.

- The use of kraal, compost manure and coffee husks whenever possible on coffee, sweet potatoes and bananas.

- Good care of, pruning and mulching of coffee.

- Better, earlier and more planting of coffee.

- Erection of drying tables for cotton, coffee and food crops.

The high standards of cultivation attained and the success of the campaign was adjudged to be most satisfactory during 1954. The competition in Mengo

was excitingly keen and was greatly stimulated by the kind assistance of senior members of the Natural Resources Group, Makerere University College and the department acting as judges. The winning gombolola in each county of Mengo receives a shield and the best cultivators are awarded prizes. In Mubende the winning county receives a shield while selected cultivators receive prizes. In Masaka, the best gombolola in Buddu receives a shield, the group a cup and individuals receive cash prizes. The challenge shields and prizes are presented by the Ministers of the Buganda Government and senior members of the Protectorate Government. After the presentation, there is considerable feasting and merrymaking and sports, with film shows in the evening. In Mengo, the Agricultural Shield Presentation Day is looked upon as an unofficial public holiday and is indeed a most important day in the life of each saza. In 1954, eleven wireless sets were presented to winning gombololas in Mengo and two to the best individual farmers in Masaka. Prize money and feast money at these presentations is supplied by both the Buganda and Protectorate Governments.

LIAISON AND CO-OPERATION WITH THE BUGANDA GOVERNMENT

The closest liaison is maintained with the Ministers at Mengo through the Agricultural Adviser to the Mengo Lukiko and at saza, gombolola and miruka levels, through the Agricultural Officers, Assistant Agricultural Officers, Instructors and Assistant Instructors. The Ministers, the Agricultural Adviser and most chiefs are fully alive to the importance of a healthy agriculture in the economy of Buganda and spare no effort in helping the department in all its propaganda to increase the agricultural potential of the country in various ways. Without the full support and co-operation of the Buganda Government, our extension work and field work would be rendered extremely difficult, if not impossible.

Extension work throughout the province has made excellent and rapid progress during the last few years which is ample proof of the close co-operation that exists between the Buganda Government and the Agricultural Department. Furthermore, the Buganda Government votes considerable sums of money annually for agricultural betterment and propaganda. These monies cover the establishment of coffee nurseries, cassava increase plots and transport of cassava, transport of compost, propaganda leaflets and posters, and feast and prize money at the presentation of the agricultural shields.

PESTS AND DISEASES

1954 was a remarkable year for the high incidence of blackarm disease and *Lygus* and *Helopeltis* pests of cotton. The latter pest was confined mainly to north Mengo. Mubende, Singo, Busiro and Bugerere were issued with undressed seed but with a blackarm resistant strain of B.P.52. In spite of this, blackarm incidence in these areas was above average. In areas of dressed seed, especially Kyagwe, blackarm was higher than in the previous year but lower than in those areas using undressed seed. Had it not been for dressed seed being issued to the greater part of the province, the toll from blackarm would no doubt have been very serious. *Lygus* was generally common throughout and did considerable damage to crop yields. *Helopeltis* was extremely severe in

north Bugerere, north Buruli and parts of Singo. In the words of the Senior Entomologist, *Helopeltis* population in Bugerere was the highest he had ever seen in his many years of service in various cotton growing areas of Africa. The effects from diseases and pests depressed yields considerably in Mengo and Mubende districts.

Cassava mosaic is still the worst disease affecting root crops in the province. A campaign to replace all diseased cassava by mosaic resistant varieties is gaining momentum but only slowly. Cassava is not eaten regularly in Buganda but is grown mainly as a famine reserve. In times of plenty, the crop tends to be forgotten and neglected and consequently gets diseased. Good progress, however, has been made in areas such as north Kyagwe, Bugerere, south Mawokota and parts of Gomba in replacing diseased material but many areas are still backward.

In Mengo, most mirukas have their own increase plots but material is still insufficient. Continued attempts are being made to interest growers in planting healthy material.

This is freely available from all the minor experimental stations and the Cotton Research Station at Namulonge. This year a few lorry loads were collected from Namulonge by gombololas in Mawokota and Busiro. The movement of cuttings had to be restricted during the mid part of the year owing to the discovery of cassava scale in one part of Mubende and north Buruli. With a view to a campaign to replace all diseased material in the Kibuga in spring 1955, a 9.25 acre increase plot was established in the Lubiri in July. The money for this project came from Buganda Community Development Grant.

The ubiquitous banana weevil continued to take a heavy toll and depressed yields in badly maintained plantain gardens. The general standard of "nsuku" maintenance in Buganda is still very low, especially in areas near the larger townships. This is rather surprising as "matoke" is looked upon by most Baganda as their staple diet. Until there is an all-round improvement in the maintenance of banana gardens, the ravages of the banana weevil will remain apparent. In the absence of chemical control, great efforts are being made by the department to encourage better husbandry and mulching of "nsuku" as well as trapping and hand picking of the weevils. In the judging for the agricultural shields in south and east Mengo, ten extra marks were given for each "debe" full of weevils collected at the time of judging. It is very gratifying to note that in one gombolola, namely Mutuba VII, Kyagwe, that 2½ "debbes" full of weevils were presented at the time of judging in December. This represents a kill in the region of 180,000 weevils. Continued picking of weevils by owners of "nsuku" should, it is hoped, have a beneficial effect in reducing weevil population throughout.

EXPERIMENT STATIONS

Bukalasa is the largest experiment station outside Kawanda in the province. Apart from livestock already mentioned, most of the farm is used for demonstrating good farming practices to the various courses.

Long-term and short-term experiments on the farm include continuous cultivation plots, fertiliser trial plots, two coffee shade treatments and a cotton variety trial plot.

A banana variety museum transferred from Kawanda was established at Bukalasa during the year.

The cotton variety BP52/NC/52/2 yielded 1,100 lb. per acre of seed cotton. A very important result came from the coffee shade experiment on Block N. 2. Shelter and ground treatments were significant. This plot is planted with Robusta Erecta coffee at approximately 10 ft. x 10 ft. and has yielded on the average for the last six seasons over 15 cwt. to the acre of clean coffee. This is considerably higher than the average level in Uganda.

Kamenyamigo Farm in Masaka is not an experiment station, its main functions being the study of a farming system with intensive cultivation of Robusta coffee and bananas and also the investigation of the possibilities of using oxen for ploughing, weeding and transport in Buganda. The soil is heavy for ox-draught and further trials will be made with a range of special light implements which is being purchased. Manuring of coffee and bananas on the farm and the proper feeding of livestock continued as they are of good demonstrational value in the district.

Kakumiro Farm in Mubende is mainly investigational and is used for the bulking up of tobacco seed for the tobacco industry in Mubende. It also has a cotton variety trial plot. Manure from the small herd now being established is used on coffee and bananas to demonstrate to and encourage other cattle owners to follow suit.

Namyoya Farm in Nakifuma now covers some 18 acres. It is used for demonstrating rotations and good farming in the area. It is much used for the bulking up of various seeds such as soya beans and groundnuts, and resistant cassava. A fertiliser trial experiment, cotton variety trial plot and a coffee nursery are also maintained. Demonstration plots of coffee have recently been planted, and a museum of local crops, such as yams of various sorts and vegetables, is also being established.

Mukono Variety Trial Centre has a plot of Mr. A. S. Thomas's Robusta "Nganda" (Spreading) original selections. Seed from the best of these selected trees is hand pulped and sent to coffee nurseries in south and east Mengo. The centre also has a variety trial plot, banana variety observation plot, coffee nursery and regenerated coffee demonstration plot. The "Nganda" selections plot has yielded an average of 8.6 cwt. of clean coffee per acre over the last six seasons. Spacing, however, is on the high side, being roughly 18 ft. x 18 ft. Yield here is little more than half of that from the Erecta on N. 2 Bukalasa.

A fertiliser trial experiment is also established at Nkozi, Mawokota, and another at Buwunga, Masaka. "Luny" tolerant observation plots continued to be maintained at Masaka. In addition to these minor experiment stations mentioned above, another six cotton variety trial centres were maintained throughout the province and another 40 coffee nurseries. Money for the maintenance of Namyoya and all 42 coffee nurseries is provided by the Buganda Government.

Section B—FOOD CROPS

The abundant rains during the last few weeks of 1953 resulted in plentiful supplies of all food throughout the province during the first few months of 1954. Although the spring rains were somewhat delayed, this caused no hardship and a very satisfactory acreage of beans, groundnuts, maize, sweet potatoes and cassava was established on the onset of the rains. Food supplies augmented by good plantings of all food crops in September continued to be satisfactory throughout the province up to the end of the year, except for localised areas around the lake shore at Mawokota, Masaka and the Entebbe peninsula, which, on account of a prolonged dry spell from about May until October, suffered from local shortages, especially "matoke". There has been a very big increase in the planting of local famine crops such as yams and *colocasia* in south and east Mengo in recent years as a result of continued propaganda. The unusually good rains at the end of November and early December came as a relief after a rather dry October and November and much food crop planting took place again throughout the province, and so brightened prospects for the immediate future.

Section C—ECONOMIC CROPS

COTTON

1953/54 *Crop*.—The acreage planted was 398,074 of which a high proportion was early planted. The crop yielded 450 lb. per acre and sales were 79,884 tons of seed cotton equivalent to 136,442 bales.

Growers received an all time record price of cents 51 for "safi" and cents 17 for "fifi". The cash accruing to growers from the sale of cotton was £4,443,974.

Perenox dressed seed was issued for planting in Kyadondo, north Kyagwe and Buruli counties and most of Bulemezi County, while the Old Entebbe area was issued with seed grown from the previous season's dressed seed. Mubende was issued with a blackarm resistant strain of BP52 from Bunyoro.

The crop in south Bugerere yielded extremely well but, owing to the severe "kyalo" competition from outside the county, the grade of cotton offered for sale at stores and ginneries in that county was very poor. Owing to the very large production of cotton in the south Bugerere area and only a small production in the Old Entebbe area, large-scale movement of raw cotton was again unfortunately necessary from the north to the south in order to comply with the legal obligation upon ginneries to restrict ginning to their quota. Distances involved in this movement averaged about 85 miles.

Detailed purchases and yields of seed cotton by zones were as follows:—

		Total Tons	Bales Equivalent	Yield per acre
Mengo-Entebbe	..	63,394	108,277	459
Masaka	..	5,128	8,759	401
Mubende-Singo	..	11,362	19,406	423
Provincial Totals and Yields	..	79,884	136,442	450

1954/55 *Crop*.—The acreage planted was 431,942 being some 8% higher than in the previous season. A higher proportion was, however, later planted, this being due to rather dry conditions in Mengo during June. Good planting weather did not arrive in the southern part of Mengo and Masaka until late August with the result that cotton planting suffered adversely in these areas. Dressed cotton seed from Kireka, Kalule and Mpigi dressing stations was issued to Masaka and all counties in Mengo with the exception of Singo, Buruli and Bugerere. These three counties and Mubende were issued with a black-arm resistant strain of BP52 grown in Mubende and Bunyoro. The season was remarkable for its high incidence of blackarm, *Lygus*, and, in parts of Singo, Buruli and north Bugerere, severe *Helopeltis* damage. This heavy damage from pests and diseases, coupled with a dry October and November, especially in Mengo District, depressed yields considerably and complicated estimation of the crop which at the end of the year was only 120,000 bales for the province.

COFFEE

25,196 tons of clean coffee were inspected for export compared with 26,998 tons in 1953. Dry conditions during flowering and setting in 1953, especially in the Masaka area, reduced expectations and adversely affected the amount of coffee coming forward to curing works during the first few weeks of 1954. Prices at curing works and hulleries for Robusta "kiboko" reached an all-time record and varied from Sh. 1 per lb. "kiboko" from the 1st January to the 30th April, to Sh. 1/50 per lb. "kiboko" from the 1st May until the closing of primary marketing on the 13th September. When coffee marketing was resumed on the 23rd October, the price was reduced to Sh. 1/25 per lb. "kiboko". The total revenue to growers from this crop was £6,806,049 compared with £4,974,000 in 1953.

The high returns from coffee have encouraged most farmers to improve their coffee and the standard of cultivation of coffee is now generally good throughout the province. Kraal manure when available is being used freely on this crop, and night paddocking for keeping down weedy plots is also gaining popularity, especially in Mengo. Mulching was well carried out in Mubende District and parts of Masaka, but owing to the fear of arson this is little practised in other areas of the province. Planting of coffee continued on an extensive scale throughout the province, being particularly heavy in Mengo and Masaka districts. It is anticipated that it will not be more than a few years before the present African production is at least doubled.

Flowering at the beginning of 1954 was the heaviest ever seen in Mengo and Mubende. Setting was excellent and conditions during the remainder of the year were more than favourable for the filling out of the crop. An all-time record crop was being picked in Mengo and Mubende as 1954 came to a close. The Masaka crop, although not a record, has also yielded well.

The unexpected dry spell which occurred during October and November in Mengo followed by heavy rains in late November and early December caused an unusual flush of flowering in north and east Mengo during the first days of December.

TOBACCO

In Mubende District, as in 1953, the curing of air-cured tobacco was confined to five of the lighter soiled gombololas. Fire-cured tobacco was grown in ten gombololas of heavier soil types and with wetter conditions. The variety Heavy Western was grown throughout the district and the crop suffered little damage from either pests or diseases. The weather conditions during most of the year were very favourable for tobacco growing. Tobacco was grown by 3,797 people as against 3,100 in 1953. There was an increase in total acreage of 200. A total of 426,684 lb. of all types and grades was marketed. This gave an average return per grower of just over £4 at cents 80 per lb. and cents 55 per lb. for Grade I and Grade II leaf respectively. The texture of the leaf was slightly above average and the grade generally good.

The actual quantity marketed is as follows: —

	Grade I	Grade II	Totals	Revenue to Growers
Fire-cured	231,757	66,495	298,252	£11,099
Air-cured	104,993	23,439	128,432	4,844
GRAND TOTAL ..	336,750	89,934	426,684	15,943

The new prices of Sh. 1 per lb. and cents 70 per lb. for Grade I and Grade II respectively announced for the 1955 season have been received with considerable satisfaction and it is expected that a good increase in the acreage planted will take place in 1955.

MAIZE

Maize was still an attractive crop during 1954 and 205,000 acres were planted during the spring rains, of which 171,000 were planted in Mengo. This acreage produced approximately 800,000 bags of maize for sale locally and for export.

Marketing, on being decontrolled, started earlier than usual and in spite of the large crop appeared to proceed much more smoothly than usual. Congestion at primary stores which was very much in evidence in 1953 apparently disappeared with decontrol.

The prices received by growers were not generally as lucrative as in the last two years and were probably in the region of 8 to 9 cents per lb. throughout. In spite of this price, the crop is still considered to be quite remunerative by many African farmers. Taking an average price of 8½ cents per lb., the cash return accruing to growers from the sale of 800,000 bags was approximately £680,000.

BEANS

The acreage planted was again high, being well over 200,000. Total recorded sales which are very incomplete were 4,351 tons. Many beans are sold locally for internal consumption, especially to large estates. Most growers have also come to appreciate the good food value of beans and much of this crop is

eaten by the growers themselves. The average price to growers was 11 cents per lb. Cash return from recorded sales was over £53,000.

GROUNDNUTS

The total recorded sales of shelled groundnuts were 2,692 tons. The price to the grower was in the region of 28 to 29 cents per lb. for unshelled nuts. The total cash return accruing to growers from the recorded sales of this crop was in the region of £127,000. A considerable quantity of the crop, however, is sold locally and eaten by the growers themselves. As a result of high prices which growers received in 1954, there is every indication that the crop will increase greatly during 1955.

CASTER SEED

In spite of a falling market with a resulting drop in sales, this crop came fourth as the main visible cash producer to the grower in 1954. 7,458 tons were exported as against 13,000 in 1953. The average price was just over 20 cents per lb., giving the growers a return of approximately £170,000. Castor plants are found mainly in south and east Mengo, Masaka and Mubende, but in recent years, however, many farmers throughout the province have planted a few odd trees. The crop requires little cultural supervision and the trees are normally planted in any available patch and often as boundary lines. Marketing activity of this crop is subject to price fluctuation; a sharp rise in price attracts more picking with a resulting increase in the tonnage marketed.

SOYA BEANS

More interest was shown in this crop during 1954 and the acreage was 10,000, being practically eight times that of 1953. South and east Mengo and Masaka were again the main sources of soya beans. Recorded exports were 1,354 tons as against 343 tons in 1953. This represents roughly a return of over £30,000 to the growers at an average price of cents 20 per lb.

III. Annual Report—Eastern Province

By D. F. STEWART, *Assistant Director of Agriculture (Field)*

Section A—GENERAL REVIEW

WEATHER

After a false start in late February, the main rains were not general until early April. Thereafter, weather conditions were ideal until an abnormal and extremely dry 7–8 weeks were experienced in October/November, followed by an equally abnormal wet December.

Once again therefore an abnormal year must be recorded, the total rains being well below average despite the wet December.

AFRICAN AGRICULTURE

The most important event during the year was the appointment of the Uganda Agricultural Productivity Committee "to prepare as part of a five-year development plan a programme for raising agrarian productivity and standards of farming in the Protectorate." The Committee's report was published in early 1955 and its recommendations, if implemented with care, will undoubtedly, in time, benefit all aspects of African Agriculture.

During the year under review the farmer generally had to contend with erratic and uncertain weather conditions resulting generally in:—

- (a) Late planting of spring food crops.
- (b) Subsequent late planting of cotton, doubly serious this year because of the dry October/November spell.
- (c) Poor yields of autumn ephemeral crops.
- (d) Low grade of cotton in the field owing to December/January rains.
- (e) Recovery and abundance of green pastures during December and January, an unusual sight at that time of the year.

Although some large acreages were recorded, the only production record expected from 1954 efforts is the 1954/55 Arabica coffee crop. From 1953 plantings a record cotton crop was produced in Busoga.

Advances were made in soil conservation work (particularly in Busoga and Bukedi which in the past were backward) in the cottonseed dressing programme, in land blocking, in *Lygus* control, and in Robusta coffee production in Busoga.

Food supplies, except for very minor local shortages made good locally, were adequate throughout the year, and depleted finger millet reserves were in many cases replenished. At the end of the year, there were more cassava and sweet potato plants in the ground than formerly.

Prices of both food and cash crops remained high, reaching new peaks for cotton and Robusta coffee. The cultivator, in consequence, enjoyed a prosperous year.

NON-AFRICAN AGRICULTURE

Sugar.—In Busoga, Madhvaninagar Sugar Estate suffered another bad year, partly through lack of rain and partly through ratoon stunting disease, producing 203,001 bags (224 lb.) as compared with 269,721 bags in 1953.

Jaggery.—Production at the five estates in Busoga and the two in Bukedi likewise was below average.

Coffee.—The two estates in Busoga prospered with high yields and high prices.

AGRICULTURAL INDUSTRIES

Ginneries.—In Bugisu, at Siroko, one more ginnery was acquired on behalf of Co-operative Societies.

During the year many ginneries were reconditioned or rebuilt to conform with the Cotton Ordinance, 1952. Many new gins were installed and ginning standards should improve.

Oil Mills.—Despite the general decontrol on the erection of oil mills, the number was not increased, remaining at 13:—

Bukedi 6, Busoga 4, and Teso 3.

Maize Mills.—The position at the end of the year was:—

Bugisu	...	4
Bukedi	...	6
Busoga	...	31
Teso	...	3
—		
TOTAL	...	44
—		

A number of these are African-owned and in most areas some of these mills ground finger millet and maize on behalf of Africans.

SOIL CONSERVATION

(a) *Prevention of Erosion.*—In Teso the high standard of grass strips, path and compound protection was maintained, the former being improved by realignment and increasing the width of the grass strip where necessary. In Bukedi there was a considerable extension in erosion control methods, spreading from Pallisa County to many other areas. Likewise in Busoga, a start has been made, mainly through the judicious implementation of the agricultural bye-laws.

In Bugisu the position was improved slightly, being fairly good in south Bugisu but backward in central and north (where a landslide caused considerable damage to banana gardens and coffee plots).

Bunds, grassed and ungrassed, increased in numbers in all permanent crop areas.

Councils of the African Local Governments continued to close and open grazing areas as required.

(b) *Maintenance of Fertility*.—There was no change in rotation policy, being 3:3 in most areas. In the more densely populated areas, other methods such as manuring and resettlement were encouraged.

The application of manure or compost presents a major problem and in Teso 25 suitable ox-carts have been ordered. In Bugisu and Bukedi demonstration carts are or soon will be available. In parts of the latter district, the making of compost has been encouraging.

(c) *Water Supplies*.—The position at the end of the year was:—

District			No. of Boreholes	Dams or Tanks
Bugisu	..	..	30	1
Bukedi	..	..	85	8
Busoga	..	..	353	4
Teso	..	..	314	86
TOTAL			782	99

(4 not completed)

PASTURE WORK

The main pasture work was continued at Serere Experiment Farm and is published in the report of the officer-in-charge.

Elsewhere in the province *Chloris gayana* was again planted in the resting plots at sub-stations and sometimes on prison farms. There has however been no extension of this practice by farmers.

In Bugisu, where the minimum of pasture is available, there has been a marked improvement in paddocking with supplementary feeding—a practice which has been demonstrated at Bududa sub-station for a number of years.

IRRIGATION

In Bugisu only, irrigation was continued on a slightly increased scale, mainly for vegetables. The popularity of the Buhugu water channel (constructed by Wachagga a number of years ago) increased, several deviations being used for coffee preparation, irrigation and home purposes.

In parts of Teso and Bukedi water use for rice growing was haphazard.

EDUCATION

Courses

(a) *Serere*.—The various courses are reported by the officer-in-charge.

(b) *District*.—In Bugisu, 19 courses were held by the Agricultural Department, the Community Development Department or the Co-operative Department (or a combination of the three) for agriculturists, clan leaders, co-operative leaders, etc.

In Bukedi, a course was given to forty cultivators from one muruka so that concentration of effort was localised and the follow-up made easier. The County Team later chose another muruka as an all-round demonstration area.

Eight courses were organised by the Community Development Department at which lectures and demonstrations were given by this department. Agricultural staff and chiefs visited the kitongole which won the annual competition.

Assistant Instructors from Busoga attended instructional courses at Bukalasa at which there was emphasis on coffee and banana cultivation.

The site for one of the major farm institutes was chosen at Arapai, near Soroti. The main function of this institute, in the first instance, will be to train staff for the Agriculture and Veterinary departments and for the proposed minor institutes as well as a limited number of teachers and private students. Later, when the staff situation is eased, emphasis will be on private students and the various courses now held at Serere.

Plans were also in hand for beginning farm schools in Teso and Busoga. These will cater only for students of a lower educational standard than will be required for the institutes and who wish to make organised farming a career.

PESTS AND DISEASES

Locusts.—Several swarms of desert locusts of varying size were reported, particularly in the north of the province, but no great damage was caused.

Cotton

Lygus caused damage above normal in the finger millet areas and was responsible for a considerable loss in crop.

Bollworms of various species were on the increase.

Helopeltis caused slight damage in parts of Bukedi.

Verticillium Wilt incidence was slight only.

Blackarm.—The annual survey produced the following figures (mean percentage of population infection) which speak for themselves:—

Zone		1953	1954	No. of seasons with dressed seed
Segregated Area	..	3.3	4	5
Usuku, N. & S. Teso	..	5.1	7	4 or 5
South Mbale	..	8.3	10	3
North Mbale	..	15.1	14	2
Busoga	..	42.5	53	—

Two seed dressing units were erected in Busoga, thereby completing the province.

Coffee (Arabica)

Antestia.—During the year, for the first time, pyrethrum dusting was done against *Antestia*, by growers themselves, in the areas where population was high (0—50 per tree) and where, in some instances, no crop had been produced for some years.

In all, 2,354 plots or some 1,045 acres were treated at an average cost per acre (excluding the Duster) of Shs. 21/70 (10 lb. per acre application) and Shs. 32/50 (15 lb. per acre).

Results were striking, the population per tree being reduced to 0-3 with subsequent excellent crops.

Applications in 1955 will be extended to the higher areas of Buhugu and Sipi gombololas.

Lace bug (Habrochila placida).—This pest increased considerably during the year in low and medium altitudes. A small trial showed that pyrethrum killed 76% of the total number of adults whilst a 10% D.D.T. dust killed only 26%. Further trials are necessary.

Hemeleia vastatrix caused very considerable damage, particularly on trees in the marginal area and on neglected trees, which were strained with the heavy crop.

The general result was early die back and the production of excessive "buni" (cherry dried on the tree).

Spraying tests will be carried out in 1955.

Bixadus Borer increased in the high areas owing to lack of control measures which now should be a routine measure in the infected areas.

Cassava

Large-scale and widespread movements of mosaic resistant varieties were restricted because of a severe cassava scale (*Aonidomytilus albus*) attack, particularly in Teso and Bukedi.

Towards the end of the year the position had generally improved.

Bananas

The banana weevil continued to take heavy toll in Busoga and Bugisu, but control measures were on the increase.

Maize and Sorghum

Stem borers continued to cause considerable but unknown damage.

EXTENSION WORK

General.—Staff continued to give advice and guidance on all general aspects of agriculture—particularly on food crops, economic crops (growing and market preparation) and soil conservation.

Specific.—

(a) *School Gardens.*—These were visited by staff as opportunity arose and help was given in the various district competitions, the standard of which improved slightly. Valuable aid was given by a member of the Education Department with horticultural training.

(b) *County Shows.*—The following shows were held:—

Bugisu.—Nambale (two days). This was the most successful county show ever to be held in the Eastern Province.

Bukedi.—Kisoko and Budaka.

Busoga.—Buyende, Wanyange and Iganga.

Teso.—Bukedea and Kaberamaido.

In most areas, county shows have completed one circuit and for next year one district show is contemplated.

(c) *Kitongole (Village) Competitions*.—These competitions continued to create interest in all districts and the time spent by staff in advising and judging was justified. The various winners were:—

<i>District</i>	<i>Village</i>	<i>Gombolola</i>
Bugisu	Namengo	Buwalasi
Bukedi	Bubali	Budumba
Teso	Ojukoto	Orungo
Busoga	Mwira	Nawaikoke
	(Special Grade)	
	Namunkanga	Namungalwe
	(General Grade)	

(d) *Prison Farms*.—The agricultural staff maintained a keen interest in these farms. In Bukedi and Teso reorganisation was in progress to make block grazing of the resting land more practicable. The eight Teso Farms were self-supporting and, in addition, were able to supply excess food to dispensaries and to collect some Shs. 5,500 from cotton sales.

(e) *Cassava Extension Schemes*.—These schemes, intended ultimately to cover each district, progressed satisfactorily, particularly in Bukedi, until interrupted by the restriction of widespread movement because of the cassava scale.

(f) *Land Blocking*.—In Teso, where the scheme originated, the position at the end of 1954 was that in four counties some 32 families have had blocked approximating to 1,889 acres.

In Bukedi, schemes for the first time were put in hand to reorganise layout and the theme “good farming through good planning” has been stressed.

(g) *Mechanical Cultivation Extension Services*.—In Teso, one tractor from Serere was able to deal with the demand which was even less than in the previous year. The decline is shown by the following figures in acres:—

	1951	1952	1953	1954
1st ploughed	270	174	135	56
2nd ploughed or disc-tilled ..	281	152	52	46
Drilled	—	—	18	10
TOTAL ..	551	326	205	112

In Busoga, operating from Busoga Farms, only 60 acres were ploughed and these mainly scattered and uneconomic to work.

Under the present arrangements therefore extension work in these two districts cannot be considered successful.

Various ox-drawn weeders were tried at Serere of which the Safim Mahon Scuffler and the Planet Junior have proved very satisfactory.

In Teso and Bugisu there are a few privately-owned tractors which are also hired to farmers. In Bukwa gombolola of Sebei this aspect is extremely well advanced.

(h) *Leper Settlement, Farms.*—At Ongino, there was a general all-round improvement with the arrival of a European manager. A secondary settlement scheme made headway at Asamuk and two further sites approved at Abela in Usuku and at Serere. At all centres advice on layout and cropping was given.

AGRICULTURAL LEGISLATION

The Bugisu District Council passed agricultural bye-laws towards the end of the year, whilst those of Bukedi are still pending.

In Busoga, the laws passed at the end of 1953, used judiciously, have been instrumental in various improvements, particularly in soil conservation.

EXPERIMENTAL

The sub-stations of Bugusege, Bududa and Bukwa and the thirteen cotton variety trial introduction-cum-demonstration centres were well maintained and in certain cases improved. Coffee work in Bugisu was in abeyance (except for three new variety trials at Busulani, Bulago and Buginyanya) pending the new proposed research station, a site for which is being sought.

Plans are in hand for the building of weighing units at a number of the cotton variety trial centres.

LIAISON WITH AFRICAN LOCAL GOVERNMENTS

Cordial relations with African Local Government chiefs and senior officials were maintained, particularly when called upon for specific campaigns. One would like to see, however, a little more initiative on their own account on agricultural matters.

Once again it has been made abundantly clear that, in areas where chiefs are interested, agriculture prospers and results are forthcoming.

CO-OPERATIVE SOCIETIES

Registered societies at the end of 1954 were as follows:—

District				No. of Societies	Membership
Bugisu	..	..	..	98	43,250
Bukedi	..	..	..	178	10,715
Busoga	..	..	..	141	12,000
Teso	..	..	..	42	1,217
PROVINCIAL TOTAL				459	67,182

In all districts there were considerable increases in the numbers of societies and members and a very substantial increase in the volume of produce handled, approximate figures (in tons) being:—

District				Cotton	Coffee	Maize	Ground-Nuts	Shea Butter Nuts
Bugisu	..	..	..	4,464	2,598	264	—	—
Bukedi	...	..	..	3,532	—	—	—	—
Busoga	..	..	..	3,310	—	—	650	—
Teso	..	..	..	330	—	—	10	10

One further ginnery was acquired in Bugisu during the year and the position now is:—

<i>Bugisu</i>	Siroko and Lukonge.
<i>Bukedi</i>	Tororo.
<i>Busoga</i>	Nabivumbi and Namwendwa.
<i>Teso</i>	Nil.

In Bugisu the then one ginnery bought more than its quota and some 2,300,000 lb. of raw cotton were allocated by the ginning pool; in Busoga, on the other hand, where the movement was still not so fully understood, some 20,000,000 lb. had to be allocated from pool buyings.

Except in Bugisu for coffee, no great advance has been made in using these unions and primary societies as channels of propaganda for better field and preparation methods. It is intended, however, in future, to press this important aspect.

Section B—FOOD CROPS

(Appendix III C)

Note.—Mbale District was officially divided into Bugisu, Bukedi and Mbale Township on 4th November and it was impracticable to separate figures this year.

General.—Despite the peculiar rainfall distribution, particularly after September, the supply of food in all districts was adequate during the year. The October-November drought reduced ephemeral crop yields but the December and early 1955 rains greatly benefited bananas and root crops.

Finger Millet.—Acreages in Busoga and Mbale were down from the previous year but luckily Teso, the most important millet district, increased its acreage from 251,640 to 290,823 acres, i.e., an increase of 16%. This increase, with reasonable yields, enabled granaries previously depleted to be at least partly replenished.

The provincial total (724,432 acres) showed a slight increase over that of 1953, but a large increase (some 57,000 acres) over a five-year average.

Beans.—The Busoga acreage was increased by some 12,000 acres but Mbale showed the large decrease of 25,000 acres resulting in a provincial decrease of 13,000 acres. Yields were fair only.

Cow Peas.—The acreage in Teso, the only district where the crop is grown in quantity, remained static at around the 70,000 mark.

Plantains.—Plantains, in short supply for the greater part of the year, because of previous weather conditions, became more plentiful later, with a corresponding reduction in price.

Plantain gardens, except in a comparatively few number of cases, remained generally at a low maintenance level.

Surveys are in progress to try and assess more accurate acreages.

Sorghum.—This crop, mainly grown in Teso, yielded well and the provincial acreage (178,593) was a slight increase over that of last year.

Sunflower.—This crop was introduced last year at cotton variety trial centres as a dual purpose crop but has not as yet been grown on any large scale.

Root Crops.—The large acreage planted in the second half of last year served the double purpose of supplying very timely food before the 1954 spring harvests and of being available against the threatened locust invasions.

As regards cassava, acreages were generally much lower than in 1953, particularly in Teso, where the figures dropped from 154,437 to 80,886 acres. This decrease was due to the carry-over and the more accurate method used to calculate acreage. The provincial total decreased from 341,604 to 251,338 acres, which was adequate, being slightly more than half an acre per taxpayer.

The sweet potato acreage decreased in Busoga, increased in Mbale and remained constant in Teso with a provincial decrease of some 12,000 acres.

As for cassava, these plantings at 186,770 acres were adequate, and, unlike last year, early planting material will be available in quantity in 1955.

Section C—ECONOMIC CROPS

COTTON

1953/54 Crop.—The acreage for the Eastern Province zones was 844,077 of which 77% was planted in May, June and July. Marketing was opened in all zones on 14th December, 1953, but unfortunately the extended late rains caused deterioration of grade, which however improved as the season progressed. The early opening was justified in that fair quantities were sold in December thereby preventing later congestion at stores even with the record crop obtained in Busoga. Growing conditions also were partly responsible for the staggering of the harvest. All in all, marketing proceeded smoothly throughout the season with no major hold-ups due to the quota system.

In all zones Shs. 50 per 100 lb. was paid for good raw cotton and Shs. 17 for other than good raw cotton.

From the 1953 acreage, 110,128 tons of seed cotton were marketed which was 11,882 tons more than the previous year and 29,284 tons higher than the last five years' mean.

Likewise, the provincial yield per acre at 292 lb. per acre was a 12-lb. increase over the 1952/53 season (north Mbale and south Mbale recording 57 and 56 lb. increases respectively) and a 28 lb. increase over the five years' mean.

Comparative sales in bales as recorded by ginnerers were:—

Zone				1954	1953	1952
				<i>bales</i>	<i>bales</i>	<i>bales</i>
Busoga	..	..	..	94,104	79,248	78,109
North Mbale	..	..	..	35,728	29,844	35,135
South Mbale	..	..	..	32,271	21,622	26,224
Usuku	..	..	..	2,825	4,560	2,337
North Teso	..	..	..	6,720	9,201	9,483
South Teso	..	..	..	8,664	8,710	8,774
Teso Segregated Area	..	..	..	7,177	7,668	8,759
TOTAL				187,489	160,853	168,821

COTTON PRODUCTION EASTERN PROVINCE ZONES

1930/31-1953/54

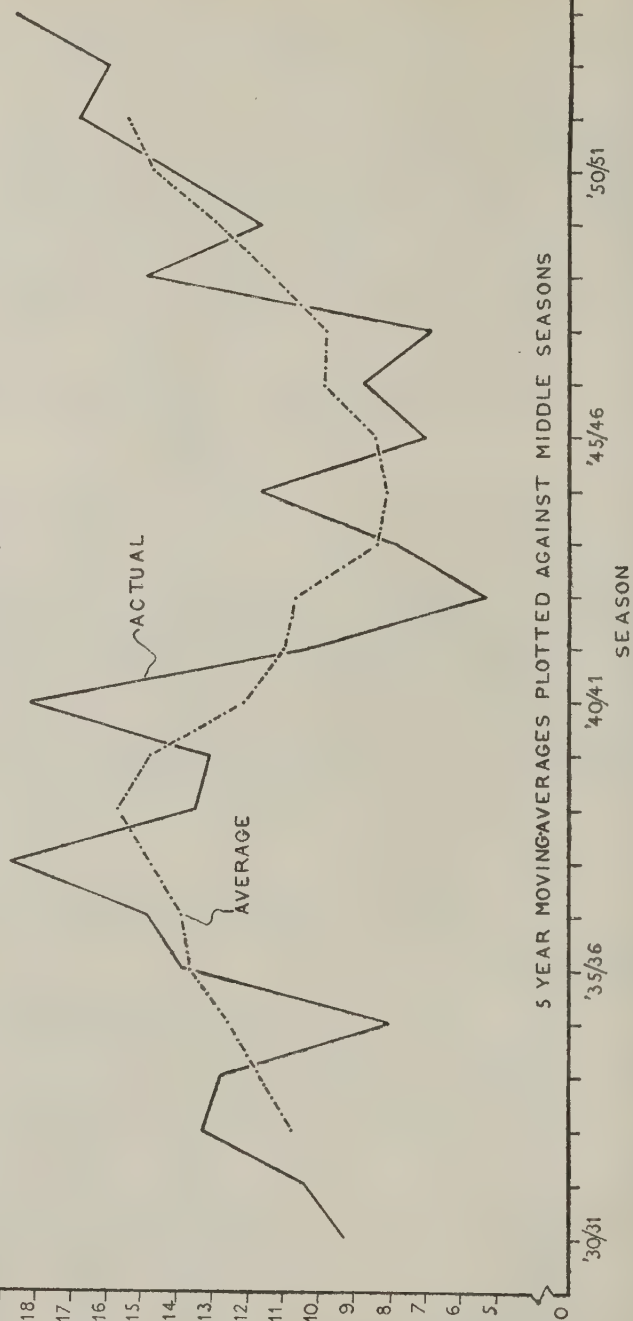


FIG. III

Busoga therefore beat its 1937/38 record by 6,491 bales whilst the Mbale zones were only 123 bales short of the 1937/38 record. S.47 was introduced into Busoga and replaced the old N.17 variety.

1954/55 *Season*.—Because of the late rains and the subsequent delay in planting food crops, the cotton crop of 878,315 acres—(a record, being 93,043 more than the previous year and 183,423 more than the last five years' average) was likewise late, only 69% of the crop being planted before the end of July, as compared with 77% last season.

In the Teso zones luckily 87% of the crop was planted before August with the result that plants were well established before the dry October and November and consequently yields will come up to expectation. In Busoga on the other hand 62% of the crop was planted by the end of July.

At the end of September crop prospects were extremely bright and with a record acreage a record crop was anticipated.

The dry October-November spell, however, coupled with a severe *Lygus* attack, upset to no mean extent these calculations, and the December rains were too late to benefit the main crop materially.

The first grades offered for sale were extremely poor and in some areas it was necessary to close buying, after which chiefs, with agricultural and administrative staff, put in some intensive propaganda resulting in a very striking improvement when buying was reopened.

In the original opening dates the principle of "early planting—early opening" was followed by zones instead of the former optimum date for the province which was not entirely suitable for any one zone. Because of poor grade and subsequent wet weather conditions, it was necessary to revise dates.

As for the previous season, no rush or subsequent congestion at buying posts took place. Likewise the buying has been, and will be, well staggered with an even flow of cotton. Prices were guaranteed at an all time record of Shs. 60 per 100 lb. for good raw cotton and Shs. 23 for stained.

Estimates of the crop have been extremely difficult and were at the end of the year:—

			<i>bales</i>
Busoga ..	..	..	70-75,000
North Mbale ..	..	..	18-23,000
South Mbale ..	..	..	16-21,000
Usuku ..	..	..	4,000
North Teso ..	..	..	9,500
South Teso ..	..	..	8,500
Segregated Area ..	..	..	6,500

A provincial production graph is given at Fig. III.

COFFEE

(i) *Arabica (Bugisu)*.—Despite 1954 being a circumcision year with the necessary preparatory ceremonies, field work on coffee generally showed a considerable improvement over that of 1953 and previous years. This improvement, coupled with favourable weather conditions, reorganised work through

co-operative societies and the *Antestia* control work, already referred to, should produce a record crop in 1954/55.

Also in July 1954 the Field Officer (Agriculture), Bugisu, and the Senior Assistant Agricultural Officer were seconded to the Bugisu Coffee Scheme together with five of the more effective of the departmental staff. The total Bugisu Coffee Scheme staff at the end of the year consisted of the above, plus 38 instructors and one test sprayer. By this changeover the Bugisu coffee crop will in future receive the undivided and continuous attention of the Coffee Officer and his staff—an effort which has been lacking in the history of Bugisu coffee.

During the year a census of coffee trees took place and is summarised below in acres:—

District Acreage All Trees	ACREAGE BEARING TREES			ACREAGE NON-BEARING TREES		
	No Banana	In Banana	% in Banana	No Banana	In Banana	% in Banana
17,000	9,450	3,800	29	2,350	1,400	37
	13,250			3,750		

This acreage of 17,000 is only slightly higher than the acreage estimated previously on the issue of seedlings. At the end of 1953 this was 14,000 plus 1,245 planted in 1954, bringing the total to 15,246 acres.

It is the intention to repeat the census every five years (again by co-operative societies) in the interim estimating yearly additional acreage by seedling issues with a reduction for deaths in the field (random counts made since 1952).

From the above table it will be noted that the percentage acreage planted in bananas since 1951 has increased from 29% to 37%.

During the year 1,245,825 seedlings were sold at 4 cents each from the 28 nurseries maintained by the Bugisu Coffee Union under the technical supervision of the Coffee Scheme. A further 40,132 were issued free as replacements for uneconomic coffee voluntarily uprooted. The average seedling survival rate improved from 70% in 1953 to 85% in 1954.

In addition to the coffee seedlings, 26,000 *Cordia abyssinica* shade tree seedlings were issued.

Marketing

(a) 1953/54 Crop.

				1950/51	1951/52	1952/53	1953/54
Parchment B.C.S.	..	..	..	3,896	2,203	510	336
Parchment N.P.P.	..	..	..	—	—	1,797	2,685
TOTAL PARCHMENT				3,896	2,203	2,307	3,021
Lights	..	..	..	41	23	26	12
"Buni"	..	..	..	433	104	21	89
TOTAL CROP				4,370	2,330	2,354	3,122

After two bad years therefore it is to be hoped that with 3,021 tons parchment in 1953/54 and an estimate of 4,200–4,500 in 1954/55, production is on the increase.

Average prices per cwt. of parchment f.o.r. Mbale were:—

	1953/54	1952/53	1951/52
	<i>Shs. cts.</i>	<i>Shs. cts.</i>	<i>Shs. cts.</i>
Scheme ..	278 59	289 74	306 81
Native ..	461 67	358 67	310 74
Lights ..	188 92	176 55	255 62
"Buni" ..	150 80	140 80	158 00

The prices for N.P.P. in the Nairobi auction were considerably higher therefore than those paid by the Ministry of Food contract for Scheme coffee.

Average prices paid to growers (after societies had deducted a 1–20 cent. levy per lb.).

	By Societies	At Pulping Stations and Buying Stores
	<i>Shs. cts.</i>	<i>Shs. cts.</i>
Parchment ..	3 60	3 52
Lights ..	2 35	2 27
"Buni" ..	1 06	0 98
Cherry.. ..	—	0 38

Careless preparation and grading of parchment and possible mixing of grades by societies and area unions resulted in a lowering of quality.

Milling loss of N.P.P. was 19·1% and the cherry/parchment ratio was 5·3: 1.

(b) 1954/55 *Crop*.—As already mentioned, a record crop is expected, but classification figures to date are the lowest ever and altogether marketing arrangements of the Bugisu Co-operative Union (the four area unions amalgamated on 1st July, 1954), the licensee of the Bugisu Coffee Scheme, were not entirely satisfactory.

A production graph is given in Fig. IV.

(ii) *Robusta (Busoga)*.—Progress was slight, 129,391 seedlings having been sold at 2 cents each as compared with 88,638 last year. Under the new method of unlimited markets, arrangements were made to try and increase marketing facilities and at the end of the year there were six applicants at 14 centres.

Temporary permission was given to Messrs. Uganda Timber and Produce Company, Limited, to process African-grown coffee at their Luzinga Estate, thereby enabling growers to receive a higher price than formerly when the coffee was transported to Buganda.

A coffee census revealed that the acreage was 1,104 (473 non-bearing and 631 bearing).

Recorded sales were 72 tons of dried cherry ("kiboko") compared with 29·5 tons in 1953 and 45 tons in 1952.

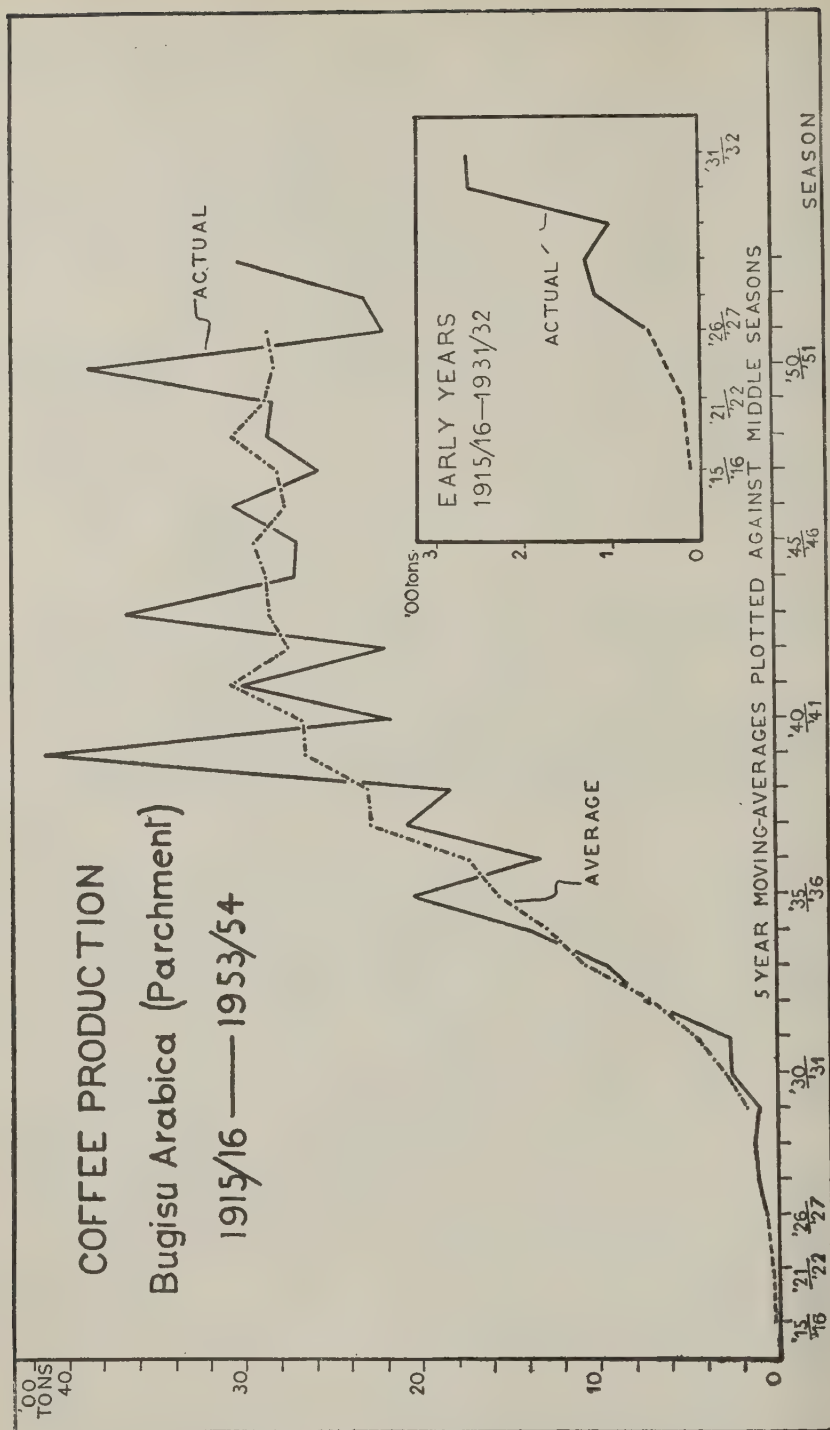


FIG. IV

Marketing

These crops were removed from the Controlled Produce Schedule and all aspects of control were lifted with a resultant noticeable deterioration of quality. It has been suggested that with the control of a marketing season and/or a price system affecting the pockets of the primary growers, this quality aspect could be bettered.

(i) *Maize*.—The campaign initiated in the early part of the year to reduce maize production to meet local requirements only was successful, the acreage in Busoga being reduced from 143,000 acres to 46,000. Sales were correspondingly reduced, being estimated at 34,630 bags (delivered to the Grain Conditioning Plant by road but not necessarily total production) as compared to 378,856 bags last year. Prices fluctuated considerably but averaged 8 cents per lb. as against 12 to 13 cents last year.

(ii) *Groundnuts*.—Mainly because of weather conditions, the groundnut acreage likewise was reduced in the province from 235,769 acres to 173,589 acres. Actual sales were not known but it is estimated that an equivalent of 6,000 tons shelled nuts were sold in Busoga and 1,200 tons in Teso.

MISCELLANEOUS CROPS

(i) *Simsim*.—The provincial acreage was 28,761 of which 26,182 acres were grown in Teso, where 170 tons were sold.

(ii) *Shea Butter Nuts*.—439 tons valued at £7,375 were sold in Teso.

(iii) Likewise, in Teso, 101 tons of cow peas, 136 tons of bulrush millet, 100 tons pigeon peas and 113 tons of honey were sold.

(iv) *Sunn Hemp*.—The seed introduced from Madhvaninagar Sugar Estate in Busoga was planted in Teso and three tons were sold at 50 cents per lb., some also being retained for increasing the crop in the autumn of 1954.

(v) *Rice*.—Because of the decline in rice production (58,638 acres in 1945 as contrasted with 4,278 acres in 1954), Dr. Watts Padwick was invited to Uganda to examine the question of diseases and general aspects of cultivation with a view to increasing production if the necessity arose. It was his opinion that this is technically possible by the adoption of better cultural methods (including better use of water) and the utilisation of disease-free varieties. It was also his opinion, however, that much detailed research was necessary on the crop.

(vi) *Income Per Taxpayer from:*—

(a) *Cotton*.

District				No. Taxpayers on Books, 1954	Total Value (£)	Shs. per Taxpayer
Bugisu and Bukedi—						
Bukedi 1953						
Bugisu 1954						
				146,626	1,986,103	271
Teso				114,742	1,214,068	212
Busoga				144,430	2,993,180	415

(b) *Arabica Coffee*—*Bugisu*.—Taxpayers 67,527; total value £1,231,791; average/taxpayer—Shs. 365.

IV. Annual Report—Western Province

By R. P. DAVIDSON, *Provincial Agricultural Officer.*

Section A—GENERAL REVIEW

WEATHER

In Ankole there was a normal dry season at the beginning of the year and it was at the end of March before the heavy rains set in. These were good and well distributed until the end of May, but June, July and the first three weeks of August were generally hot and dry. September rainfall was unsatisfactory and the southern and eastern parts of the district suffered from lack of rain until November, when good rains became general and continued up to the end of December.

The first three months of the year were hot and dry in Bunyoro but after that the weather followed an unusual pattern for there was no mid-year dry season and later certain crops suffered from excessive rain.

Kigezi had more than the average rainfall and distribution was abnormal, with February and December as the wettest months; these times are usually comparatively dry with rainfall peaks occurring in March–May and September–November. Taken generally, however, the weather was favourable to agricultural production though some small, scattered areas suffered from severe hailstorms.

Toro started the year with a very dry period but during February and March there was some benefit from light scattered showers. From then onwards exceptionally heavy rains fell over most of the district and the total precipitation for the year in Fort Portal is given as 83.38 inches compared with the forty-year average of 57.5 inches.

AFRICAN AGRICULTURE

The Western Province as a whole had another year with conditions favourable to food crops and although there was no marked improvement in standards of cultivation and, in some areas, a reduction in the acreages of the major crops, the year ended with adequate, or even abundant, supplies of food in all districts.

1954 showed increases in the cotton crops marketed in Bunyoro and Toro and in the acreages planted during the year. The high prices stimulated further interest in coffee and there has been extensive planting and better management of coffee plantations. Owing to the competition of cotton, the fire-cured tobacco crop in Bunyoro fell by about 20%. The new flue-cured tobacco industry in north Kigezi expanded rapidly from the experimental plantings of 1953 and, although there is much room for improvement in yield and quality, considerable progress has also been made with the air-cured crop. With the slackening in demand and drop in prices, there has been a decline in

the popularity of maize and the dangerous tendency to plant too much of this crop has been halted in Kigezi. Efforts to resuscitate the flax industry met with some success so far as the 1953/54 crop was concerned, but this could not be sustained owing to the poor return to the growers. The Kigezi vegetable scheme continued to expand.

The outstanding problem of the province is the over-population of Kigezi and the need, which is bound to become acute before long, of moving and re-settling many thousands of families. Soil conservation, in all its aspects, was intensively encouraged and there were notable advances in land use, especially in Busongora. In Kigezi the land utilisation survey was pressed ahead and is now nearing completion. Group farming was fostered in Bunyoro and there is the nucleus of a new movement in Busongora County. Agricultural shows were held in Ankole, Bunyoro and Toro and soil conservation competitions in all districts.

NON-AFRICAN AGRICULTURE

In Bunyoro there has been a considerable extension of coffee planting, using mostly self-sown seedlings, and in certain estates mature coffee was rehabilitated. Rubber prices were hardly sufficient to cover labour charges and little tapping was done; for the same reason not much interest was taken in papain. A small acreage of sugar cane for jaggery has been planted. The Uganda Sisal Estates Limited at Masindi Port produced 1,220 tons of sisal which sold at an average price of £60 per ton.

Tea planting continued to be the major non-native enterprise in Toro. Apart from the dry conditions of January and February the weather was beneficial to tea except that during some of the cold, dull periods there was insufficient sun, and there was also some hail damage. The high prices stimulated further interest in coffee and there has been some extension and improvement.

AGRICULTURAL INDUSTRIES

Considerably activity took place in the cotton industry, with the rebuilding of Masindi Town, Hoima and Kinyala ginneries in Bunyoro, and the erection of a new ginnery at Kasese in Busongora, Toro, which will replace Kaija, near the Mubende boundary. A cotton seed dressing station to serve Bunyoro is in course of erection at Hoima. One of the maize mills in Mbarara continued to function but the other was refused a licence because of the state of the buildings. In Bugangari, Kigezi, the rapid expansion of the flue-curing tobacco industry has already been mentioned and eight barns were erected during the year. The flax factory at Kisizi carried out the retting and processing of the increased crop produced in Ankole and Kigezi. The two large factories in Toro continued to deal with the tea grown on their own estates, as well as with that of outgrowers, and a new factory is in course of construction.

MARKETING

Apart from cotton in Toro, which is mentioned later, there were no major marketing difficulties in the Western Province during the year. In Bwamba the exclusive licence for coffee, which had been held by the old East Africa Trading

Company for a number of years, expired and licences were issued to two Indian firms and to one African, but unfortunately the latter has not yet constructed a satisfactory store. With the fall in price of coffee towards the end of the year there was a stiffening in the attitude of the curing works in Masaka and Kampala as regards quality and, although there was no noticeable decline, some dealers reported difficulty in disposing of their produce. From various parts of the province complaints have been made about fluctuations in the price of many staple crops and no doubt this has had an effect on acreage. For example, in Ankole groundnuts fell from 60 cents per lb. in July to 40 to 45 cents and as a result there was a heavy drop in the acreage planted to this crop during the second rains.

SOIL CONSERVATION

In all districts the policy of laying out land on the block system was encouraged except on the steeper slopes. Adequate precautions against erosion are taken by limiting the number of contiguous contour strips to what is considered safe for the slope, the type of land and the rainfall of the area concerned. The width of the strips varies from 30 yards in the plains of Busongora down to 12 yards in the undulating country of north Kigezi, and the strips are separated by three-yard grass wash-stops, or by bunds planted with *Paspalum* or some other suitable grass.

Mention was made in last year's report of certain criticisms about the planting of black wattle in contour lines on the bare hillsides of Ankole and Kigezi, as a result of which a policy of sowing the seed on back-sloping terraces or in ditches has been advocated. This is, of course, an extremely laborious proceeding on steep, stony land, and it has not been possible to maintain the same rate of planting. Special attention has been paid to thinning out the young trees at the proper time.

Throughout the province, the staff of the department have continued their efforts to impress upon chiefs and cultivators and, indeed, upon all concerned the paramount importance of conserving the soil. There is no doubt that considerable progress is being made, the most rapid advance in recent years having been in the eastern part of Busongora. Until two or three years ago, before this county had reached its present eminence as the main agricultural area of Toro, the Bakonjo and their holdings scattered over the lower slopes of the mountain and there was the usual wasteful use of the land. Many of them have now accepted the idea of group cultivation on contour strips of suitable width, with effectual wash-stops in between, and whole hillsides at Bwera and Karambi have been laid out in this way. Provision has been made for a sufficiency of resting land and the hilltops have been reserved for tree planting. In the plains of Busongora also group farming is being encouraged and 106 acres of cotton were planted in 1954 in blocks laid out on the Teso system, the land having been ploughed by the Mechanical Cultivation Unit. An area of 3,000 acres has been set aside for development in this way at Nyakatonzi. Independent individual cultivators, too, have been induced to improve their methods, and many are now

laying out their plots in 30-yard strips separated by a three-yard grass wash-stop or by a bund. Lack of trees to provide poles for the building of houses has been one of the main difficulties to be overcome in our endeavours to bring about permanent settlement in the plains, and land has been selected for the establishment of plantations of eucalyptus at Nyakatonzi and elsewhere. As a temporary alleviation of the lack of houses, arrangements were made by the District Team and the Native Government to send down many thousands of poles from Fort Portal. The opening up of the old channel from the Kanyampara River to supply water to the settlers has been mentioned elsewhere.

In Kigezi the problem of soil conservation becomes more acute as each year brings forth a further increase of fifteen thousand mouths to be fed. The precipitous slopes of much of southern Kigezi prohibit the introduction of block cultivation until such time as better conservation measures are devised. Much of the land on the alternate strip system cannot be used to the best advantage because the strips are too narrow or too inaccessible to be properly grazed, and a considerable acreage is taken up by the unproductive bunds or banks between the plots. The urgent need is for some satisfactory and productive plant to grow on the bunds which will provide fodder for livestock as well as bind the soil. Elephant grass, which has long been used, is unsatisfactory because of its edge-effect, but no better substitute has so far been found.

The width chosen in the past for the contour strips in Kigezi has been 12 to 16 yards and the problem of preventing the denudation of the upper parts of the strips has been the subject of much discussion. The use of trash bunds along the centre of the strips, thus halving their width without increasing the edge-effect, suggests itself and the efficiency of this practice is now being investigated.

The Agricultural Officer is quoted as follows:—

“Many of the soil conservation efforts are nullified by the method of cultivation; at each cultivation more soil is dragged down the slope, the top half of the plots becoming progressively more barren, with the good soil accumulating around the bunds; thus after a time there is a tendency to pull down the bunds and cultivate over them, and so constantly moving the soil lower and lower down the slope. This problem is not easy of solution, since the steepness of the slopes prevents cultivation up-hill and only a person with an adjustable peg leg could cultivate satisfactorily across the slope. Apart from the labour involved in terrace construction, many of the terraces would be so narrow that the edge effect would reduce yields out of all comparison. Under the best land management many of these slopes would not be cultivated, except possibly for permanent orchard type crops or forestry. The only genuine solution to this problem is depopulation, with subsequent control over land utilisation and a strict limit on further population expansion. This raises grave moral and social issues, which are beyond the scope of this report; but any other measures, such as increased yields by better husbandry or seeds are merely palliatives, and should only be accepted as such.”

The Agricultural Productivity Committee has estimated that some 80,000 people may have to be moved from the congested areas during the next five years but, at the same time, have far-reaching proposals for the rehabilitation of the areas which will have been relieved of excess population, and of Kigezi District as a whole.

ANIMAL HUSBANDRY

Some increase in the use of kraal manure on permanent crops such as coffee and bananas can be recorded in all districts. In Ankole, where most of the cattle are in the hands of the Bahima, mixed farming is still not very commonly practised but it is expected that the increase of settlement in the more fertile parts of the grazing areas will have an effect in time. Four ploughing oxen are in use at Rubare Farm. The establishment of a small "Nkedi" breeding herd at Bulindi Farm in Bunyoro was postponed as investigations kindly carried out by the Tsetse Control Department are not at present encouraging. At Kachwekano the herd was maintained, and a new local bull was obtained in July. The Veterinary Department have investigated the slow rate of breeding and this is now thought to be due, at least in part, to cobalt deficiency. A new ram was purchased and the breeding flock of sheep was carried on satisfactorily. The goats bred very successfully during the year with the introduction of another sire and promise to be a sound economic proposition. In Kigezi District, the overstocking problem still remains but the partial change-over to a block system and the closing of certain areas to cultivation, with the encouragement of rotational grazing, has given some temporary relief. In Toro some extension of mixed farming is reported from Mwenge and, with the use of antrycide prosalt, it is expected to effect an increase in the numbers of cattle kept by farmers. The "Nkedi" herd of cattle at Kyembogo produced fifteen calves during the year and although the cattle are rather leggy and poor in conformation generally, due to too much "Katarega" blood, the health of the herd has been extremely good. Some of the cattle confiscated in Kyaka for illegal movement have been used to form the basis of a herd at Kyegege Prison Farm. The extensive schemes proposed by the Agricultural Productivity Committee for Ankole, Bunyoro and Toro should be of great value in improving livestock management and land utilisation.

PASTURE WORK

Grass museums have been started at all district farms, and interesting results have been obtained at Kyembogo from trials of rape and lucerne. Work on the establishment of leys and permanent pastures was continued at Kachwekano. Night paddocking has been introduced here and at Kyembogo, and it is hoped that at the latter farm this may be of some help in fighting against "lumbugu" (*Digitaria scalarum*).

IRRIGATION AND WATER SUPPLIES

Excellent work in swamp reclamation has been done by the people of Nyakabande and Bukimbiri, Kigezi, who, by a purely local effort, have brought 60 acres of swamp into productive use. The Nyanja swamp experiment, initiated by the Senior Chemist for the investigation of possible ways of reclaim-

ing barren patches, was continued, the land now being under sweet potatoes which followed maize. Results so far have been significant for the phosphate lime interaction but not for individual treatments. The Hydrological Department completed their drainage scheme in Mumwalo swamp, much of which is now cultivated, and also carried out surveys of several other swamps. Further surveys of Kigezi and of the other districts in the province were carried out by Sir Alexander Gibb and Partners, on behalf of the Protectorate Government.

In Busongora, Toro, the Agricultural Officer undertook the rehabilitation of the old water channel formerly running from the Kanyampara bridge towards Nyakatonzi and by the end of the year very real progress had been made.

AGRICULTURAL EDUCATION AND EXTENSION WORK

Agricultural Officers and their staffs kept in close contact with the re-organisation and development of school gardens in all districts and carried out the judging of the garden competitions. Some of the gardens reached a very high standard, but one of the main difficulties is always the school holidays, which interfere with maintenance and often prevent planting at the proper time.

In Mbarara, a week's course for chiefs from all districts was organised by the Community Development Department in March, and lectures were given by Agricultural Officers and other senior staff, besides officers of other departments.

County shows were held in Ankole, Bunyoro and Toro, with encouraging results.

Soil conservation competitions were held in all districts, that in Toro being combined with a village improvement competition which stimulated a good deal of interest in the general improvement of living conditions.

Agricultural courses were held at district farms for chiefs and farmers and for members of our staff, emphasis being laid on practical demonstration and participation in the work being done. Several lectures were given to schools, groups of growers and co-operative societies. Articles of agricultural interest were submitted to the Runyoro newspaper *Mwebingwa* by members of the staff in Bunyoro and Toro.

The Senior Assistant Agricultural Officer from Ankole proceeded to England in August to attend a one year's course in agriculture at Durham University.

Eight Assistant Instructors went to Bukalasa for the apprentices' course and three were considered worthy of further training. One Instructor from Toro attended a refresher course at Bukalasa.

PESTS AND DISEASES

No really serious damage was done by pests and diseases in the Western Province during 1954. Kagera dwarf locusts were present at usual in Ankole, Kigezi and Toro but although some loss was caused to the finger millet crop, the staple food of this pest is grass. Several swarms of desert locusts were seen in Bunyoro but no damage was done; a few locusts of this type were

reported from Ankole and Kigezi. The usual common pests, such as *aphid* on peas; banana weevil, *antestia*, mealy bug and berry borer on coffee, *Lygus* and stainers on cotton, and stem-borers on maize were all present and where the losses they caused were worthy of special note, they have been mentioned later under the appropriate crop.

Many complaints were received of damage to food crops by elephants, hippo, buffalo, baboons, monkeys, pig and porcupines but these were mostly from small, localised, outlying areas.

Panama disease on bananas in Ankole is widespread but does not appear to cause any disastrous reduction in yield: Tip-rot (*Thelaviopsis paradoxa*) is also present. *Puccinia polysora* rust on maize in Bwamba has not as yet had any devastating effect. Mosaic disease on cassava continued to be fought by the distribution of resistant varieties, but the position was complicated by the discovery of cassava scale in Bunyoro, which necessitated the destruction of all stocks at Bulindi and the cessation of distribution. Mosaic disease was also present on tobacco and soya beans, and on the first-named crop crinkle leaf virus caused some anxiety in Kigezi. Pasm disease and dodder have been mentioned elsewhere in connection with flax. Blackarm was responsible for the lowering of cotton yields in central Bunyoro, but it is hoped that next year the seed dressing station at Hoima, now in course of erection, will combat this disease.

EXPERIMENT STATIONS

At Rubare Farm cropping continued during the year on lines similar to 1953 but the poor yields on parts of the station and the results of soil analyses carried out by the Senior Chemist proved that the soils are very low in fertility and mostly decidedly acid. The banana garden was extended by adding to the collection of local varieties, and catch crops were discontinued among the young bananas in favour of mulching. On this farm, where "lumbugu" (*Digitaria scalarum*) is a menace, it has been found that the three-yard grass wash-stop, advocated as a soil conservation measure in parts of the district, functions as a harbourage of this weed and these have been removed from the coffee plots. Their place has been taken by *paspalum* bunds, and the whole plot has been mulched and manured. The castorseed observation plot made good growth, as did the eucalyptus plantation. The annual crops grown during the year were maize interplanted with beans and groundnuts, and these crops grown separately for the observation of varieties and for seed increase; collections of local varieties of finger millet and sorghum; six varieties of peas; a manurial trial on sweet potatoes; and a trial of four varieties of soya beans. An important function of the farm was the propagation and distribution of mosaic resistant cassava varieties. An extensive coffee nursery and a vegetable garden are also maintained. Four work oxen were obtained from Mbarara Stock Farm but the present lack of an experienced ploughman detracts greatly from their usefulness.

In the Rubaya-Rushozi resettlement area a few strips were cleared for the purpose of trying and demonstrating the suitability of various crops. So

far, good results have been achieved with groundnuts, sorghum and "bulo"; maize was indifferent and other crops were badly damaged by game and birds. It is proposed to demarcate twenty acres near the dam for possible development as an agricultural station to serve this somewhat difficult part of Ankole.

At Bulindi Farm the coffee shade and mulching demonstration plots gave heavy yields and the seed produced was planted in the nursery, which was considerably extended, and also in the district nurseries. Local varieties of bananas were collected and planted next to the existing "lusuku".

A large number of tobacco beds were sown to provide a reserve supply of plants to neighbouring growers, and three acres of Heavy Western tobacco of seed imported from Nyasaland were grown for seed production. A cotton variety trial was conducted for the Botanist, and other annual crops included finger millet, sorghum, groundnuts, peas, beans and sweet potatoes, grown for observation and seed increase. Unfortunately, it was necessary to destroy all stocks of cassava on account of scale, thus terminating one of the farm's major functions.

Kachwekano Farm was maintained as a demonstration of soil conservation and sound farming policy. Trials and observation plots of local food and economic crops, grasses and legumes were carried on and interesting initial results were obtained from the 1953 Grazing Experiment where "Kachwekano Mixture", consisting of *Chloris Gayana*, *Bromus ciliatus* and New Zealand white clover, gave a very high stock-carrying capacity. The "museum" Arabica coffee plot, which had been reduced in size and heavily pruned, continued to give no appreciable yield. Night paddocking of cattle has been introduced, with somewhat doubtful effects on the condition of the cattle during the cold, wet weather.

At Kyembogo Farm the coffee and bananas yielded well and a great variety of vegetables were successfully grown. Among the annual crops, "lumbugu" is the major problem and night-paddocking of the strips is being tried. One strip was treated with trichloro-acetate, with rather disappointing results.

At Nyaruru in Bwamba the cocoa, manilla hemp and Robusta coffee were maintained, and at Ruigo nearby there is a small station consisting of a coffee nursery and plots for the multiplication of mosaic resistant cassava and *pas-palum* grass. The cinchona at Yeria was kept on a care and maintenance basis.

MECHANICAL CULTIVATION

The Tractor Contract Service working under the Special Development Section started operations in Bunyoro in February and completed its programme in June, when, unfortunately, the exigencies of the service made it necessary for the Field Officer in charge to be posted elsewhere. Six tractors were in use and work was done for 28 groups or individuals on 341 acres, most of which received two cultivations. During the year the headquarters of the unit were moved from Masindi to Bulindi, where the tractors were laid up and serviced in preparation for 1955. A Munyoro who bought a Ferguson tractor in 1953 used it throughout the year on his farm in the Waki Valley.

In Toro the unit of three Ferguson tractors started the year successfully but later several breakdowns occurred and tremendous difficulty was experienced in obtaining spare parts. The demand for ploughing in Busongora far exceeded what it was possible to do, but during the season approximately 150 acres were ploughed and disc-tilled. There is no doubt that the work of the three tractors was a major stimulus to the development of the group farming system being fostered at Nyakatonzi.

A non-African in Ankole purchased a Fordson diesel tractor with a disc plough and rotovator and ploughed small scattered areas in many parts of the district, but the dispersion of his efforts necessitated the charging of uneconomic prices. There is certainly a considerable desire for contract ploughing in Ankole and much benefit might well accrue from this first experimental attempt to meet the demand. The chance of success will, of course, be very much greater if teams working under competent mechanics can be established in the more promising areas.

RESETTLEMENT

As a result of intensive propaganda and a growing realisation on the part of the senior chiefs that there really is an overpopulation problem in Kigezi, there was a considerable increase in emigration from the congested areas to North Kigezi and to Ankole District. The total number of people who moved, including women and children, were 2,745 to Kinkizi and Ruzumbura and 4,304 to Ruampara, Igara and Ishingiro in Ankole. Whilst these figures are a great advance on previous years, they only represent half a year's population increase in Kigezi, and if 80,000 people are to be resettled in the next five years, extensive areas will have to be found in Ankole and Toro districts. Undoubtedly, there is ample land available but the whole problem needs a very careful approach. This has been fully realised by the Agricultural Productivity Committee, who recommended that wherever resettlement schemes are proposed the reception area should be laid out according to a pre-arranged plan, and the appointment of a Special Projects Officer is envisaged. His function will be to arrange for possible new areas to be surveyed, in the widest sense, and to co-ordinate the efforts of all concerned. With another favourable year in Kigezi, the overcrowded people there do not feel unhappy in their present circumstances, but a famine or serious food shortage will cause an unprecedented exodus for which adequate preparations should immediately be made.

The Land Utilisation Survey started in Kigezi towards the end of 1953 was pressed ahead with all available staff and the work is now nearing completion. Much interesting information is emerging, which will be of great value in planning the rehabilitation of the district.

Section B—FOOD CROPS

ANKOLE

The harvest produced during the second rains of 1953 kept the district well supplied with food until the next harvest became available and, with the favourable conditions enjoyed by most of the district, reserves were in a satisfactory

state at the end of the year in spite of some reduction in acreages. The maintenance of banana gardens has improved and there has been an increase in the practice of planting sweet potatoes on tied ridges. Owing to the fall in prices a good deal of the beans, groundnuts and maize that would otherwise have been sold were consumed locally.

BUNYORO

There were adequate supplies of food throughout the district during the year but, with the threat of locusts, encouragement was given to the planting of sweet potatoes and cassava, though not with much success. The computed acreages of the major food crops show a decline but the agricultural staff claim they do not give the real picture since the chiefs' returns do not take proper account of all the plots planted. It is true, however, that the high price of cotton and the preoccupation of the growers with the growing of tobacco, coupled with the plentiful supplies of food usually available, make it difficult to interest the Banyoro in intensive food campaigns. With the abundant rains, however, Bunyoro ended the year with plenty of food to last until the next crops are harvested.

KIGEZI

This district had another fortunate year as regards weather, and fear of famine has again been thrust into the background so far as the immediate future is concerned. It is still true that one really bad season would place the over-populated parts of Kigezi in a very precarious position since the reserves held in the granaries would last only a very short time. In 1954 the staple cereal, sorghum, gave good yields and there was a satisfactory increase in the acreage of sweet potatoes, with considerable planting in reclaimed swamps and swamp margins.

TORO

Except in the vicinity of Fort Portal, where most of the male population have other means of employment, large reserves of food were available in the form of maize, beans and cassava. The surplus was purchased by Kilembe Mines, the tea estates, TUFMAC and other employers of labour. Bananas were in steady supply with no violent fluctuations in prices; much effort was put into the improvement of the standard of cultivation of this crop, so important to the Batoro. The difficulties over selling cotton in Busongora caused a temporary dearth of cassava flour, and some anxiety was expressed over the decline in acreage; the Bakonjo, however, have been active in planting up large plots during the second rains and at the end of the year future prospects were satisfactory.

Section C—ECONOMIC CROPS

COTTON

1953/54 Season.—The variety grown in Bunyoro was again B.P.52/6 and marketing started in Biseruka in December. Buying proceeded smoothly though some co-operative and other societies were extremely slow to grade and

prepare their cotton for sale. The total crop amounted to 5,528 tons (9,543 bales) of which 277 tons were bought as B Grade.

Toro grew the same variety of cotton, using seed from Bunyoro. Owing to a small outbreak of plague it was necessary to postpone the opening of the buying season in Busongora for one week until 8th February. Marketing was full of trouble and sorrow due to the larger crop, plague precautions, lack of storage and inefficient buying organisation. Buying was not finished in Busongora until the first week of June and the total crop amounted to 3,332 tons (5,520 bales) of which 68 tons were bought as B Grade.

Grade and quality were up to the average for both districts except at Biseruka and Kabale, where the standard was lower than in the rest of Bunyoro.

1954/55 Season.—In Bunyoro planting started in May, again using local B.P.52/6. Weather conditions were favourable during the planting period which extended into September but the continuation of the heavy rains during the later stages of growth caused considerable damage by *Lygus* and blackarm in central Bunyoro. A short dry spell at the end of November helped to ripen the earlier plantings but heavy rains in December had a most adverse effect on the grade. 30,325 acres were planted, compared with 25,227 in 1953, and the crop is estimated at 7,500 bales.

Toro was again supplied with B.P.52/6 cotton seed from Bunyoro, but planting was late in the main producing areas because it had taken growers so long to get rid of their previous crop. Only about half the cotton had been put in by the end of August and the rest was planted in September. There was abundant rain during the early period of growth and the crop made excellent progress, being remarkably free from diseases and pests. Wet weather in December caused a lowering of the grade. The acreage planted is given as 35,534, compared with 23,199 acres in 1953. In Busongora, where the great bulk of the cotton is grown, there has been a marked improvement in spacing, but in Mwenge and Kyaka, where a special intensive campaign had been launched, little progress can be reported. In Bwamba a large reduction in production is expected because of the depredations of cotton stainers, which are particularly troublesome there because they can use the many kapok trees as alternative hosts. The Toro crop is estimated at 6,000 bales.

COFFEE

In Ankole the number of coffee nurseries was kept at 45 and these were expanded and improved during the year. 92,000 Arabica and 67,000 Robusta plants were issued to growers during the first and second rains and it is estimated that approximately 10,000 Arabica and 49,000 Robusta plants were stolen, mostly during the first rains. Measures were taken to tighten up control of the nurseries and with the employment of guards and the heavier punishment of thieves, there was comparatively little stealing during the latter part of the year. Maintenance of established coffee was well up to last year's standard and showed improvement in many places. Little pruning is normally done but most plots are mulched at least once a year. The standard of picking and drying still leaves much to be desired but, with the higher quality now being

demanding by the curing works, growers and buyers may now be willing to lend a more attentive ear to our exhortations. Since all the Ankole coffee finds its way to the curing works in Buganda no reliable returns of purchases can be given.

In Bunyoro the departmental nurseries at Bulindi, Hoima and Masindi were enlarged and the Bunyoro Native Government has established four new nurseries, one in each county. 14,000 Robusta plants were issued, but many growers helped themselves and also obtained self-sown seedlings from estates. A census has revealed that there are at present just over 100,000 coffee trees of all ages in the district, of which more than half were planted in 1954. This shows the vastly greater interest now being taken in the crop and, with better cultivation and management, it is likely that Robusta coffee will become increasingly important in Bunyoro unless there is a disastrous collapse in the market. Enquiries from licensed buyers have elicited the following returns of sales of dried cherry:—

1952	13 tons
1953	39 tons
1954	71 tons

In northern Kigezi 38,000 Arabica and 1,900 Robusta plants were given out, and further nurseries were established in the southern part of the district, from which controlled issues will take place in the first rains of 1955. There has been a welcome improvement in the standard of management of coffee plantations, most of which are mulched, with good measures taken for soil and water conservation.

The Toro coffee nurseries were well-maintained and, in view of past difficulties, small plantations of trees have been established at many centres to ensure the future supply of poles. 73,000 plants of both types were issued during the year and, in order to reduce wastage, the number allowed per grower at one time has been limited to 25, with the price raised to 6 cents per tree. Some further improvement was achieved in the standard of cultivation, especially in Bwamba and there has been a great increase in production.

TOBACCO

Fire-Cured, Bunyoro.—Preparation of nurseries was carried out in December and January and sowing commenced in February. The increase in prices from 74 cents to 80 cents per lb. for Grade I and from 50 to 55 cents for Grade II leaf raised little enthusiasm among growers and the number of beds sown was almost exactly the same as in 1953. A fresh importation of Heavy Western seed from Nyasaland was sown in the southern half of Bugahya saza. Germination was good everywhere and except for a few cases of neglect the seedlings grew well. Planting out began in April and was continued through May and even into June in some areas due to the intermittent dry spells. Owing to the greater attractions of cotton and other cash crops, it was impossible to stimulate much real interest in tobacco and the acreage declined from 3,913 in 1953 to 3,519 acres. The early plantings made good growth and the late crop benefited considerably from the rains which fell through what is normally the

mid-year dry season. Hail damage was slight and although the weather was rather wet during the time of curing, the quality of the leaf produced was well up to average. Marketing started on 4th October and was finished during the first week of December; except for some difficulties with co-operative societies, all went smoothly. The total crop purchased amounted to 1,664,070 lb. of which 1,270,933 lb. or 76.4% was Grade I and 393,137 lb. or 23.6% Grade II. In 1953 production was 2,126,983 lb. of which 71.9% was Grade I. New prices of Sh. 1 per lb. for Grade I and 70 cents per lb. for Grade II leaf have been announced for 1955 and it is hoped that this will give fresh impetus to tobacco production.

Air-Cured, Kigezi.—The tobacco grown in the second rains of 1953 yielded 1,107 lb. of Grade I and 5,461 lb. of Grade II, making a total 6,568 lb. from 46 acres planted in Kinkizi and Rubaya. Yields and quality were poor, due mostly to the inexperience of the growers and of our own staff, and to the high incidence of crinkle-leaf virus. In the first rains of 1954, 79 acres were planted and gave 1,137 lb. of Grade I and 19,169 lb. of Grade II, or a total of 20,306 lb. Yields per acre were considerably improved, at an average of 257 lb. per acre, but still very low. The small amount of Grade I is mainly due to picking the leaf before it is mature and to indifferent curing and grading, a legacy from the rough and ready methods that were usual with nicotine tobacco. A great deal of propaganda has been spread concerning the improvement and expansion of air-cured tobacco cultivation in Kinkizi and Ndorwa and it is hoped that the enhanced prices will establish the Kigezi air-cured industry on a firm basis. 111 acres were planted with the second rains and good growth was reported from most places. The practice of planting tobacco on tied ridges or terraces has been introduced in certain areas because of the great danger of erosion with this crop on steep land.

Flue-Cured, Kigezi.—Messrs. Kigezi Industries Limited continued their programme of development in Bugangari and have now built eight curing barns and one large bulking shed. The crop grown in the first rains produced some 15,000 lb. of cured leaf from 48 acres and though much of this was of the lower grades, valuable experience was gained by both the growers and those doing the curing. Visiting experts have expressed the opinion that some of the best leaf compares favourably with that from other flue-curing areas in Uganda. In the second rains 109 acres were planted and the crop showed a remarkable variation in growth, probably due to differences in fertility, some of which may be due to temporary nitrogen deficiency on newly-opened land. Some loss of crop was caused by hail damage and by crinkle leaf virus. Buying of green leaf began in December and it is expected that the crop will yield 40,000 to 50,000 lb. of cured leaf.

OILSEEDS

Groundnuts.—In Ankole, which is the only district in this province where groundnuts can be regarded as a cash crop, there was a heavy fall in the acreage planted during the second rains. This is stated to be a reflection of the sharp fall in price from 60 to 40 cents in July. The crop grew well, however, and yields were good. In the other three districts, because of greater

prosperity, groundnuts are gaining popularity as a food crop and the fall in maize prices caused increases in acreage. 38 tons were marketed in Toro.

Linseed.—59 tons of linseed were produced from the flax crop in Ankole and Kigezi.

Sunflower.—The fickle demand has caused this crop to lose such popularity as it once enjoyed and production was on a very limited scale.

Simsim.—There was a slight decline in acreage in Bunyoro, but with prices at 40 to 45 cents, sales are given as 161 tons compared with 48 in 1953.

Castor Seed.—Small quantities still come to the markets in all districts but there is now little systematic cultivation and harvesting of this crop.

GRAIN CROPS

Maize.—In Ankole and Bunyoro the fall in prices resulted in a reduction in acreage. In Kigezi, where considerable trouble had been experienced in disposing of the 1953 surplus, although a considerable acreage was planted with the first rains, there was a welcome and large reduction in the second rains crop. In Toro the Bakonjo in Busongora continued to plant maize extensively and were responsible for the bulk of the 15,000 bags produced. In all districts the crop was disposed of locally without much difficulty at prices ranging from 6 to 10 cents per pound. With ample supplies in other parts of Uganda, the Western Province policy is now one of internal self-sufficiency for each district. Except for some very poor maize in parts of Ankole and Kigezi, both crops grew well and gave reasonable yields. The practice of spacing the rows six feet apart and interplanting with beans or groundnuts is being pressed in all districts.

PULSES

Beans.—In Ankole there was apparently a further decline in acreage but it is doubtful if this was in fact true since much of the bean crop is planted in small plots around the homesteads and these are not counted by the chiefs. Except in the areas which suffered from drought, an average yield was obtained. In Bunyoro there has been an increase in the interplanting of beans among cotton and maize, and this was so too in Busongora and Bunyangango, Toro, where there was a large increase in production. In Kigezi, yields of both crops were good during the year but the bulk of the crop was used for home consumption.

Soya Beans.—Ankole shows a slight increase in the acreage under this crop. Growth was satisfactory and yields up to the average but there was an unfortunate fall in price from 40 to 20 to 25 cents per pound in the middle of the year. No useful sales figures are available.

Field Peas.—The low prices offered (20 to 25 cents per pound) during the first half of the year caused loss of interest in this crop and there was a reduction in acreage in Ankole. In Kigezi, where peas are mainly a food crop, there was an increase in production and although the first rains crop suffered fairly severely from *aphid* infestation, the second crop was remarkably free from this pest.

MISCELLANEOUS CROPS

Flax.—Marketing of the crop planted in Ankole and Kigezi with the second rains of 1953 began on 22nd February and was completed in mid-March. Total purchases were 276 tons of straw and 59 tons of seed, more than twice the amounts bought in the previous season. The quality of the straw was much better than in 1952/53 and Kamwezi produced some outstanding samples up to 44 inches in length and of even diameter. Other good areas were Lubale and Rwamucucu but at the other end of the scale were Bwongera, Rugeya and Ruhinda which were very poor for yield as well as quality.

Sphaerella linorum was a serious disease only in these three gombololas and in Nyakagema. Retting began on a small scale in March but progress was slow because of heavy rains which made drying difficult in April, May and June and it was early August until retting and drying were finished. The factory commenced operations on 1st June but shortage of labour restricted output and processing dragged on until the beginning of December.

The following table gives a comparison between the last four crops:—

	1950/51	1951/52	1952/53	1953/54
Acreage	400	364	358	506
Straw, tons	303	166	130	276
Seed, tons	56	27	29	59
Fibre, tons	21.4	13.3	8.47	18.39
Tow, rescutched	10.7	7.0	4.7	9.42
Tow waste, rescutched	5.28	3.7	3.47	6.2
Fibre out-turn	9.3%	8.0%	7.6%	8.5%

After the low ebb of 1952/53 the results of our efforts were distinctly encouraging and another intensive propaganda campaign was launched before the planting of the 1954/55 crop with the object of further increasing the acreage and improving standards of cultivation. Unfortunately, however, the return to the grower of Shs. 113/76 per acre, although much greater than in previous seasons, still does not enable flax to compete on anything like equal terms with other cash crops, and the area planted dropped from 506 acres to 470. Sowing was carried out in showery weather in late September and early October and the crop started well. Subsequent growth was generally satisfactory but rather uneven due to soil and climatic differences. Dodder infestation was fairly high and there was a good deal of lodging due to the heavy December rains. *Sphaerella linorum* made its appearance shortly before harvesting but the extent of the damage will not be known until the straw is in our hands. High hopes had been pinned to the new variety "Hollandia" with which 134 acres had been planted in Kasambya, Kayonza and Lubale gombololas, and it is disappointing to learn that it shows no marked superiority over "Stormont Gossamer" in the field. Altogether, the year has ended with rather a gloomy outlook for flax.

Onions.—Poor and fluctuating prices, caused by heavy importations from outside East Africa, tended to restrict production. It is felt that if growers would learn to dry their onions for storage after harvest, they would be able to take advantage of the higher prices ruling during periods of scarcity. Interest-

ing results were obtained at Kyembogo Farm where onions hanging in the store have been kept successfully for nine months.

Solanum Potatoes.—These are a crop of some importance in Kigezi where sales are reported to have amounted to 712 tons valued at £7,832. Supplies could be further increased if the Kampala market were less subject to rapid changes in price and demand, depending upon supplies from Kenya. Potatoes are also gaining more popularity as a food crop in this district.

Vegetables.—The Kigezi Vegetable Scheme continued to function under the auspices of Messrs. Kigezi Industries Limited on the lines described last year, the output having been maintained at two lorry loads per week. A good range of high class vegetables was sent to Mbarara, Masaka, Kampala, Entebbe, Luzira and the East African Railways and, besides the more ordinary types of produce, supplies have included asparagus, globe artichokes and strawberries. Prices to the grower were raised during October and, with 278 registered growers now producing vegetables for the scheme, it is expected shortly to increase purchases to three lorry loads per week. A demonstration garden was laid out in the Nyanja swamp, using irrigation to overcome seasonal fluctuations in production. The value of the vegetables bought through the scheme amounted to £6,115, including 171 tons of potatoes and 29 tons of onions.

Wheat.—Planting returns in Kigezi indicate a large increase in the acreage, but the amount offered for sale is unknown. In the main the crop is used internally, for food as well as for the manufacture of beer. Increasing attention is also being paid to this crop in Toro.

Rice.—A small crop is grown in Bwamba, most of which is eaten by the growers, though some is sold to the Indian community.

V. Annual Report—Northern Province

By G. D. BADGER, *Provincial Agricultural Officer*

Section A—GENERAL REVIEW

WEATHER

The dry season broken only by localised storms continued until the middle of March, when conditions became progressively more unsettled and localised storms increased in frequency. The early rains finally broke throughout the province on the 1st April. Well distributed and generally above-average rain was received until mid-June in all areas, with the exception of the lowlands of West Nile, where there were dry spells during April and May. The second half of June was dry everywhere except in Lango. Further rain fell in early July after which conditions were mainly dry until the last week of the month. Unusually wet and cloudy weather persisted throughout August and into the third week of September. October and November were exceptionally dry but the position was eased somewhat by a wet spell in the closing days of November extending into the first week of December. Subsequently conditions became progressively drier until the end of the year.

AFRICAN AGRICULTURE

The 1953/54 cotton crop in the West Nile zone was easily a record one, while in other zones there was again evidence of increased demand for cash, and a number of progressive individuals and groups showed sustained interest in farming as an economic venture. The marked increase in cotton production dates from the 1948/49 season when the crop rose from 11,300 tons in 1947/48 to 30,700 tons. After this remarkable development, further expansion took place and the record was achieved in the 1951/52 season. Details of cotton sales in the province during the last ten seasons are given below to show the trend in production:—

<i>Season</i>		<i>Production</i>
		<i>Tons</i>
1944/45	..	11,333
1945/46	..	10,285
1946/47	..	16,882
1947/48	..	11,377
1948/49	..	30,700
1949/50	..	31,477
1950/51	..	26,386
1951/52	..	41,958
1952/53	..	25,927
1953/54	..	34,741

Up to October the 1954/55 crop was most promising and there were good prospects of a record. The high hopes were, however, dashed by the untimely drought in October and November.

Growers of flue-cured tobacco experienced a disappointing year, yields being exceptionally low, chiefly owing to excessive rain and lack of sunshine in

August and early September. The air-cured crop fared rather better but yields were below average.

In contrast with cash crops the growing of food crops was far more successful and the year will no doubt be remembered by farmers on account of the excellent grain harvest in Lango, Acholi and Karamoja. In Karamoja it will also be remembered for the exceptionally good growth of grass. The failure of the second rains in October reduced autumn plantings of root crops but cassava reserves were retained at a satisfactory level. The threat of a serious invasion by the desert locust, however, remains.

There was no slackening in the demand for mechanical cultivation, both from areas already served and potential new ones. It is significant that our oldest customers continue to be extremely interested and in some cases reliant on tractor cultivation, and have been prepared to concentrate their arable land into larger blocks in order to take advantage of the cheaper rates of hire. There is still a considerable number of farmers who tend to regard the tractor as an easy means to higher production with less effort.

There was little improvement in the standard of clearing prior to opening, except in areas of sparse bush. Experience has shown that clearing with a winch is extremely slow where the bush intensity is high and that farmers tend to lose heart. It would appear that provision of mechanical bush-clearing facilities should form part of any scheme to expand the use of ploughing with tractors, at least in areas of moderate to heavy bush. In this connection an experiment was initiated at Alito in Lango whereby 50 acres of moderately heavy secondary bush were cleared with a D-4 Caterpillar tractor in order to obtain information on the economics of such clearing. The present indication is that costs may be within the reach of cotton growers. The cleared area has not however been ploughed and it will be necessary to take several crops off the area before the efficiency of the operation can be judged.

Contract ploughing was again undertaken by the East African Tobacco Company Limited for tobacco growers. A total of 138 acres was ploughed.

A progressive farmer in Acholi who had some 70 acres of tobacco and food crops under cultivation in 1953 built his own tobacco barns (three) in 1954. He grew 45 acres of flue-cured tobacco and successfully cured the leaf himself. In addition he cultivated approximately 25 acres of cotton and food crops.

The co-operative tobacco curing project at Olili in West Nile had a very disappointing year, the bulk of their first crop being ruined by hail. In the course of the year, ways and means were examined whereby African tobacco growers could participate in the processing of their crop. As a result, a pilot scheme will be started in early 1955 in which a group of growers in West Nile will take over a barn unit and run it themselves with limited assistance from the East African Tobacco Company and departmental staff. In Lango, where the East African Tobacco Company decided to close its leaf production centre, it has been arranged for a growers' co-operative to take over, with the aid of a loan from Community Development funds, three curing barns left behind by the company. It is planned that the society will grow and cure its own tobacco with the aid of departmental staff seconded on a temporary basis. Both pilot

schemes are to be treated as co-operative enterprises with advice and assistance from the department. If the above schemes prove successful, it is hoped they will lead to the adoption of a comprehensive scheme whereby growers will be enabled to take over barn units in established tobacco areas, growing and curing their own leaf for sale to the company. In Lango it may be that similar societies will be started if the present one is successful.

The enclosing of small paddocks by progressive farmers continued in Lango, while some of the larger cattle owners in the district became interested in fencing areas of 50 acres and upwards.

Spraying against *Lygus* was tested on a field scale in Lango and Acholi with very promising results in the latter district.

NON-AFRICAN AGRICULTURE

In West Nile which is the only district where farming is practised by non-Africans, Messrs. Busby Brothers had another successful year, producing 50,000 lbs. of saleable flue-cured leaf from 80 acres. Messrs. Sthankiya Brothers planted 30 acres of Arabica coffee on their Nakulu Estate which has now 65 acres of the crop in bearing. Unfortunately a hailstorm during the main flowering period reduced yields and a total of only five tons of clean coffee is expected. Only 10 acres of the Otrevu Estate were opened during 1954, the area being sown to tobacco and used mainly for fertiliser trials.

AGRICULTURAL INDUSTRIES

The reconstruction and rehabilitation of ginneries in accordance with the specifications laid down in the Cotton Ordinance, 1952, continued in all zones. By the end of the year work was practically finished on Aloï, Aboke, Palango and Ngetta ginneries, while it was anticipated that Aduku and Ngunyboke would be ready for operation within two months of the close of the year. In the Kumam part of the Lango zone reconstruction work on Kabulubulu Ginnery was nearing completion at the end of December. At Rhino Camp in the West Nile the work of building a new ginnery of 30 double roller gins continued. It is anticipated that ginning will start in early 1955. In the Acholi zones Unyama Ginnery was rebuilt in time to gin the 1953/54 crop, while work was started at Minakulu and Paranga which should be complete in early 1955.

Gulu Oil Mill was in operation throughout the year. This is the only oil mill in the province at present.

The East African Tobacco Company Limited continued to flue-cure tobacco in Lango, Acholi and West Nile. The company purchased all green leaf produced for flue-curing with the exception of that grown and processed by the Olili Society in West Nile and by Mr. Akera at Lakwatomer.

In response to a growing demand by farmers in West Nile to participate in the curing of their own tobacco, two possible schemes put forward by the East African Tobacco Company were examined by Government, but it was finally decided that before a comprehensive plan could be decided upon it would be necessary to have a small pilot scheme commencing in 1955. In accordance

with this decision, arrangements were made for an experienced group of tobacco growers, who had formed a co-operative society, to take over a unit of two tobacco barns from the East African Tobacco Company at a peppercorn rent. The society will grow and cure its own tobacco with technical advice from the company. Assistance will also be given in the transport of fuel and supplying of certain materials on repayment. The department will second a supervisor with experience in the growing and curing of tobacco for a period of not longer than two years while the society's own men are trained to take over full responsibility.

In Lango, the East African Tobacco Company, as a result of an acute labour shortage and the slow expansion of tobacco growing in the Anyeke area, decided to close the Ngai and Anyeke centres at the end of the 1954 season and concentrate their efforts in Acholi and West Nile. The company was influenced in its decision by the fact that considerable capital expenditure would have been necessary for the centre to have continued for a further trial period. When this decision was taken arrangements were made for a group of growers to purchase, with the aid of a loan from Community Development funds, a three-barn unit situated at Ngai. As in West Nile, the group will carry out nursery and field work and cure its own leaf with the aid of seconded departmental staff. The period of secondment will not exceed two years and the assistance will be given on the understanding that the group send their own men for training at the East African Tobacco Company's centre at Gulu.

MARKETING

The large 1953/54 cotton crop in the West Nile zone caused serious marketing difficulties and during the second half of the season storage and transport facilities (both road and water) proved inadequate to deal with a crop of this size. The position was further complicated by an acute shortage of gunny bags at the peak buying period. Owing to lack of storage at markets and at Rhino Camp Ginnery, it was necessary to permit storage in bags in the open in order that buying might continue. Growers became increasingly dissatisfied with the marketing arrangements and some "fifi" cotton was not sold. Ginning was not completed until the end of November and the final consignment of bales and seed left the ginnery during the first week of January 1955. As a result of experience in the 1953/54 season, and to a less extent in previous seasons, there is a rapidly growing demand from growers for a substantial increase in the number and size of stores and "Kyalo" transport, so that the arrangements may be brought nearer to parity with other zones. Normal "Kyalo" transport is not however feasible except in the central buying circuit.

In other zones, where the crop was proportionately smaller, marketing proceeded smoothly and adequate "Kyalo" transport was provided with the exception of the redundant ginneries at Ekwera, Chagwire and Bata. Arrangements were made for one lorry to operate from each market. The lorries were however based on working ginneries and frequent complaints of insufficient "Kyalo" transport were received owing to the late arrival of lorries and in some cases shortage of petrol. The facilities, however, showed a considerable improvement on the very unsatisfactory arrangements made in the 1953 buying season.

Cotton observers worked at all buying points in the four zones. The value of these men varies greatly according to the keenness and ability of the individual. It is thought that the system should be retained for the present.

The amount of cotton handled by co-operative marketing societies continued to increase. Forty new societies were registered bringing the total in the province to 97. The largest number operated in Acholi where a little over 2% of the total crop was sold by societies. In West Nile, commission at the rate of 65 cents per 100 lb. was paid within 10 miles of Rhino Camp Ginnery. Outside this 10-mile limit no commission was paid but free transport was provided. In other zones 65 cents was paid to the majority of societies but in Lango several societies received Sh. 1 per 100 lb., the higher commission being paid for above average grade.

Marketing of the 1954/55 crop opened on 13th December and closed temporarily from the 23rd to the end of December. The grade of cotton offered for sale during the first week was on the low side, but vigorous action by district staff raised it to a satisfactory standard. Arrivals were not heavy but the amounts sold prevented any serious congestion when markets re-opened in 1955. The early opening is popular with the people but ginners complain that their expenses are increased unnecessarily in that they have to hold their cash advances from banks longer and also engage buyers earlier than hitherto. Chiefs tend to be on the side of those who support the January opening date as they feel that possible tax evaders may market their cotton without being approached to pay tax. All, however, agree that the grower who plants early is rewarded with cash for his Christmas festivities.

Tobacco marketing was arranged as in previous years, the East African Tobacco Company buying all the green leaf in Lango, Acholi and West Nile for flue-curing, and the air-cured crop in West Nile. Reports received indicate that growers were far more satisfied with arrangements for the purchase of air-cured leaf than in previous seasons, and the amount of leaf sold in the Sudan dropped considerably.

Marketing of sunflowers and Arabica coffee was arranged administratively, markets being provided in all producing areas. There were no sales of simsim or shea butter nuts. A small amount of groundnuts was sold in south Lango.

SOIL CONSERVATION

There were no outstanding developments but progress in improving the demarcation and maintenance of grass wash-stops was well maintained. Group farmers were particularly co-operative both in marking out grass wash-stops and in their maintenance throughout the cropping period. This is especially encouraging as the area of the blocks cultivated by these groups tends to increase and become more concentrated each year. Agricultural competitions did much to focus attention on the importance of soil protection.

In south Lango no overgrazed areas which had been closed by local councils were re-opened and no new ones were closed. The control of tsetse fly in Buruli in north Buganda led to a large-scale movement of cattle from the heavily

stocked areas on the Kioga peninsula, with a consequent decrease in the risk of overgrazing. In Karamoja the enclosure with thorn fences of a badly overgrazed and eroded area of seven square miles near Moroto was completed early in 1954. Closure was also started on another severely overgrazed area of ten square miles near Toror Mountain; this work was nearly finished at the end of the year. In addition, five areas of up to two square miles were fenced.

The work of the Geological Survey Dam Construction Unit in Karamoja was held up by the abnormally heavy rains and only one dam was completed. The present policy is to build dams in clusters with a distance of approximately five miles between individual dams. In this way it is hoped to avoid the heavy overgrazing and erosion caused near isolated dams.

The urgent Karamoja problem brought about by the sequence of overgrazing, removal of grass cover, soil deterioration and finally bush encroachment, in the wet season grazing areas, received detailed consideration. A rehabilitation plan is being prepared and will be carried out by a land utilisation unit consisting of a senior administrative officer, technical officers of the land use departments and four specially appointed field officers.

ANIMAL HUSBANDRY

Breeding herds were maintained on departmental farms at Ngetta and Abi while the running of the African Local Government herd at Moroto continued to be supervised by the department.

At Ngetta the herd was culled and its numbers reduced to a total of 112 head at the end of December, when the composition of the herd was:—

Cows 22, bulls 17, heifers 22, bullocks 34, calves 17.

In the course of the year four young bulls were issued to selected stock-owners and 13 cows and heifers together with a bull were sold to the Bunyoro Agricultural Company. Of the animals recently culled the best will be transferred or sold to Aler Farm School. The breeding herd of 24 head was under the herd bull "Rukara" while "John Owili" was in charge of the ranged herd. As in previous years the cows in the breeding herd were milked once a day early in the morning, the calves running with their dams after milking until evening when they were housed separately for the night. The ranged calves did better than those of the breeding herd, their mean monthly live-weight gain being nearly 20% higher. Twelve animals slaughtered during the year gave a mean killing percentage of 49%.

There was a change in the breeding policy of the Abi herd, it being decided that selection would be made from the large Alur type of cattle only and that all the small Lugbara cattle should be sold. The herd will be kept under good management and selections made for a dual purpose animal. Owing to the low tick infestation spraying was carried out as required instead of at weekly intervals as in 1953. It was feared that the tick population might become so reduced that animals might fail to contract East Coast Fever as calves. The herd numbered 53 at the end of December and was made up as follows:—

Cows 12, bulls 5, heifers 9, bullocks 12, calves 15.

The Moroto dairy herd produced 12,470 pints which were sold in Moroto Township. The average milk yield per animal was 2.5 lb. per day. Bulrush millet, sorghum and Indian kale were ensiled, but the silage has not yet been fed to stock. A pit silo was used. A small amount of hay was made for feeding during the dry season.

In Lango two dairy schemes were started for producing milk for sale in Lira Township. The milk was sold through the African Local Government dairy in Lira.

The enclosing of small paddocks of up to four acres continued and the total area paddocked in this way rose to 53 acres. Some of the larger cattlemen have shown interest in fencing larger areas, chiefly it is thought owing to heavy fines imposed for damage to crops. One paddock of 43 acres was fenced in 1954.

PASTURE WORK

The long-term grazing trials comparing natural regeneration and seeded pastures as soil rejuvenators and as a source of grazing during the fallow period, were continued at Ngetta and Abi, together with the grass management experiments testing the effects on the grass and subsequent crops of continuous and deferred grazing, and also of different times of commencement of grazing. The latter series of trials will be completed in 1955.

The grazing trial laid down at Iriri in the dry weather grazing grounds of Karamoja continued without change. The experiment consists of four 100-acre paddocks, one grazed continuously, and the other three grazed rotationally at the rate of one beast to five acres. Burning and no burning are also compared. The experiment is open to the criticism that the burned and unburned sub-plots are not fenced and that differential grazing takes place. Burning normally takes place in March and it has been noted that as a result of the heavy grazing of the post-burning flush, some loss of *Themeda triandra* occurs through the dying out of the closely grazed clumps. It is proposed to fence the sub-plots in 1955 and to prevent the grazing of the burned plots within one month after burning. The general indication is that stock can be carried at the rate tested, but it is not yet clear whether heavy grazing after burning has a permanent effect on the grass stand.

In the thorn scrub eradication trials at Cholol and Koloswa, chiefly owing to the good rains, there was a marked improvement in the grass cover and in the re-establishment of perennial grasses in the plots where stumping had been carried out.

In 1954 further trials to test ways and means of eradicating bush and restoring a stable and productive grass cover, were laid down in the wet season grazing grounds in Karamoja. The treatments were as follows: —

1. Closed only (control).
2. Closed and *Hypharrhenia* species sown.
3. Bush stumped at ground level. *Hypharrhenia* species sown.
4. Bush stumped at ground level and allowed to regenerate naturally.

5. Bush stumped at ground level and ploughed and *Hypharrhenia* species sown.

6. Bush stumped at ground level and ploughed and allowed to regenerate naturally.

The preliminary findings are that ploughing and sowing grass can speed up regeneration to a marked degree.

IRRIGATION

The indigenous irrigation systems at Agoro, Paloga, and Pama in East Acholi formed a valuable source of planting material of sweet potatoes during the early rains. Work on the construction of irrigation channels for use during the 1954/55 dry season had not however started by the end of the year. It is hoped that sorghum and maize will be planted in early 1955.

The Namalu irrigation scheme at the western foot of Mount Debasien was maintained without expansion of the area cultivated. The chief crop was rice of which six acres were grown. Other major crops were groundnuts and finger millet. The following yields per acre were recorded: —

Rice (clean) ...	...	...	816 lb.
Groundnuts (unshelled) ...	...	...	470 lb.
Finger Millet (grain) ...	...	...	392 lb.

In addition a wide variety of European vegetables including tomatoes, onions, cabbage, cauliflower and carrots were grown successfully. A small plot of sugar cane also grew well.

At Nadunget in Karamoja the flood irrigation scheme did not have a very successful year. An unusually heavy storm on Moroto Mountain caused the river to overflow its banks in early April, bursting the main conducting channel and flooding the cultivated area with such force that the banks between plots were broken. After this initial flooding rainfall was sufficient to maintain the crops without further flooding. It was disappointing that the local people showed no interest in taking over plots in the scheme.

Yields per acre on departmental plots were: —

Finger millet (grain) ...	...	...	600 lb.
Sorghum (grain) ...	...	...	461 lb.
Maize (dried cobs) ...	...	...	404 lb.
Groundnuts (unshelled) ...	...	...	130 lb.

The Ngiminito scheme had a much more successful year. Twenty-one local people rented plots at Shs. 20 per acre and with one exception the rent was paid promptly. Flooding was carried out according to plan and excellent crops were obtained. Yields per acre in departmental plots were: —

Finger millet (grain) ...	...	...	1,283 lb.
Sorghum (grain) ...	...	...	1,104 lb.
Maize (dried cobs) ...	...	...	1,062 lb.
Groundnuts (unshelled) ...	...	...	1,864 lb.
Rice (clean) ...	...	...	966 lb.

The soil at Nadunget is much poorer than that at Ngiminito.

EDUCATION

A total of 120 people attended courses of one week at Ngetta. Four courses were held for cultivators, two for members of co-operative societies and two for students from local teacher-training centres. The cultivators' courses, on which a number of women accompanied their husbands, were popular and most of those attending appeared to be interested, particularly in the demonstrations and trips arranged in the district. Unfortunately the period during which cultivators will leave their holdings is limited, October and November being the most popular months.

General courses of one week were held for village chiefs at two county headquarters in Acholi. Four periods of each course were devoted to agriculture and lectures were delivered by departmental staff.

The first batch of pupils completed their two-year course of training at Aler Farm School in Lango in December and proceeded to the areas they had selected for their farms in early January 1955. The pupils have been given every encouragement to establish group farms, it being considered that the pre-war scheme of training smallholders failed because they went out as individuals and were easily discouraged by their less progressive fellows. Of the 23 boys who completed their training 18 have formed groups of seven, six and five. Groups receive by way of assistance on leaving the school four oxen free and a loan of Shs. 2,500 which is repayable in three years. In addition, each pupil successfully completing the course, whether he is a member of a group or not, receives a grant of Shs. 200 towards the building of a house and a 50% share of the value of the crops he has grown on the school farm during his period of residence; this amounted on average to approximately Shs. 500 per pupil. The follow-up work will fall mainly on departmental staff. There are vacancies for 36 boys in 1955 of which 25 had been filled by the end of the year.

A new principal was appointed to Gulu Farm School in June and a considerable improvement in the general running of the farm is already apparent. Fifteen pupils attended the school during the year. All pupils have a further year's training to complete before leaving the school.

Koboko Farm School admitted 20 pupils at the beginning of the year bringing the total to 30. Two pupils however left the school during the year. The late principal of Gulu Farm School was posted to Koboko in June. The school is developing slowly and has not yet got into its stride.

PESTS AND DISEASES

During the first quarter solitary specimens of desert locust were found in east Acholi only; a new invasion, however, commenced in early April. Moderately large flying swarms were reported from Namalu in Karamoja and two places in north-east Lango during the third week and subsequently three reports were received from east Acholi. In the first half of May Karamoja was invaded by several small swarms. In June no swarms appeared until the last few days of the month when reports of three large swarms were received from north Karamoja. The only reports received in the third quarter were of five swarms in Karamoja

and two in east Acholi. A further invasion commenced in October when single swarms were seen in the West Nile and in Karamoja. In November several swarms passed over Lango flying in a north-westerly direction and later Acholi and West Nile were invaded, the latest reports being of the swarms flying into the Belgian Congo. After the rains in late November and early December no further swarms were seen apart from three in Acholi at the end of the month. No serious damage was caused to crops during the year and no egg laying occurred.

Blackarm was more severe than usual in the 1954/55 cotton crop in the West Nile zone, but elsewhere the disease was reported to be about normal. *Lygus* damage was not heavy except on some of the larger group farms in Acholi. *Helopeltis* was locally severe in south Lango.

Flue-cured tobacco in all districts suffered from an unusually severe attack of "frog eye" brought on by the wet weather in August.

An outbreak of cassava scale which was first discovered in the province in Moroto County of Lango in December 1953 has since been found in two areas in south Lango and in a single plot near Gulu.

EXPERIMENT STATIONS

The need for an experiment farm serving Acholi District had been appreciated for a number of years, particularly since the introduction of flue-cured tobacco. An application for 200 acres of land for this purpose at approximately mile 9 on the Gulu-Opit road was approved by the Acholi District Council in November. The area will be developed as a district experiment farm and field trials on tobacco will form an important part of the experimental programme. In addition, a part of the farm will be set aside for machinery testing by the Special Development Section. Development of the farm will start in 1955, but before opening begins it is proposed to make a detailed survey of the soils and vegetation so that a permanent record of the area before development will be available.

At Ngetta the long-term grazing trials were maintained together with experiments on annual crops including tobacco planting methods, inorganic fertiliser trials, cotton variety trials and observation plots on a variety of food crops. The main farm has now been under its rotation of three years cropping and three years resting under grass for 21 years.

Further land was cleared and opened at Abi in West Nile. No expansion of the experiment programme was undertaken in accordance with the decision of the Experiment Committee. The farm, which serves mainly the middle altitudes of the district, carried out experiments on tobacco planting methods, seed rate, spacing and time of planting of sunflower, duration of fallow, and a grass grazing trial comparing seeded pastures with natural regeneration. Observation plots were also laid down on food crop varieties.

Cotton variety trials were conducted at four centres. These centres were also used for a number of other trials and seed multiplication. In West Nile a small farm was maintained at Zombo to serve the higher parts of the district and was used for observations on Arabica coffee and food crops, including bananas.

EXTENSION WORK

Routine touring by field staff remained the all important means of putting propaganda across to farmers. Of the other methods, agricultural competitions must be placed high on the list; it was found particularly useful in improving soil conservation in West Nile. Newsletters to chiefs are of value as reminders of work requiring attention, and in passing on information such as crop prices.

County shows were held at five places in the province, each district having at least one show. Demonstrations of all the main items of propaganda were prepared at all shows and it was encouraging to see the number of people who were keen to study the demonstrations and listen to what the person in charge had to say.

Prison farms with a few exceptions were well run and served as useful demonstrations.

Increase plots of mosaic resistant cassava were maintained at all divisional headquarters in Lango and Acholi and at twenty-three centres in West Nile.

LIAISON WITH AFRICAN LOCAL GOVERNMENTS

Relations with chiefs and councils remained excellent at all levels. The election of a number of serving members of the department to councils has greatly assisted co-operation. In certain cases good work has been achieved because the chief of the area was an agricultural instructor prior to his appointment.

Section B—FOOD CROPS

Food supplies decreased steadily until May but reserves proved more than adequate, except in localised areas in east Acholi, east Madi, and on the shores of Lake Kioga in Lango. The position improved in all parts from May onwards with the ripening of the ratooned sorghum. Dry sowing of finger millet commenced in January and a good acreage was established, very little re-sowing being necessary. Growth was excellent everywhere except in parts of the lowlands of West Nile, and the final crop was one of the largest harvested in the last decade in Lango and Acholi. An exceptionally good sorghum harvest was reaped in Karamoja. The early sweet potato plantings did well while the acreage of groundnuts and simsim showed upward trends compared with 1953, in all districts. Dry weather in October and November reduced the yields of some of the later plantings of food crops and seriously interfered with the swamp and valley plantings of sweet potatoes; the acreage under the crop shows a considerable fall on the 1953 figure. The area of cassava planted in 1954 was less than 1953, but there was a good carry-over from the previous season. At the close of the year the general food position was satisfactory and grain reserves in most parts were the highest for a number of years. There were, however, prospects of localised shortages in east Acholi and in the lowlands of West Nile, where less favourable rains were received than elsewhere.

Section C—ECONOMIC CROPS

COTTON

1953/54 Season.—Marketing opened in West Nile on 4th January, all other zones in the province having commenced buying in December. Weather

conditions were favourable and little difficulty was experienced in maintaining grade. The standard in West Nile, however, was not quite as high as is normally attained in that zone. Details of sales of seed cotton are given in Appendix IIA. The West Nile crop of 8,794 tons was 28% above the previous record. The total of 34,741 tons of seed cotton for the province, including Kumam, is the second highest crop on record. The prices paid were 50 cents per lb. for "safi" and 17 cents for "fifi", except in West Nile where 20 cents per lb. was paid for "fifi".

1954/55 *Season*.—The West Nile zone received much poorer early rains in the cotton growing areas than elsewhere, dry spells being experienced in April and May, and in addition the June/July break in the rains was more prolonged than in other zones. In the Lango and Acholi zones opening of land for cotton started in good time and planting had commenced in many parts by the end of May and excellent progress was made in June. After the break in the rains planting proceeded rapidly and substantial increases in acreage were attained, in east Acholi and Lango, compared with 1953. The prolonged wet, cool weather in August retarded growth and made weeding difficult. Preoccupation with harvesting the large millet crop also interfered with weeding in Lango and Acholi. Good growth was made in September and by October the condition of all plantings was excellent, except in West Nile. Dry weather in October and November in all zones severely checked growth causing heavy flower and boll shedding. The position was, however, improved by good falls of rain in late November and early December. At the end of the year the crop estimate was 64,000 bales.

TOBACCO

Air-cured (West Nile).—200 nursery bed were maintained by the department for sale of seedlings to supplement growers' own supplies. As in 1953, the majority of people preferred to grow their own and not all seedlings in departmental beds were used. There were, however, localised shortages due to failure of private beds and some seedlings from flue-cured tobacco nurseries were planted in the air-cured crop. Transplanting commenced in mid-April but was held up by dry weather until the end of the month. By the end of May 1,285 acres had been established, compared with 1,236 acres in 1953 and 1,016 acres in 1952. The stands of all except the late plantings were satisfactory. Dry weather in May and June checked growth but subsequently the weather was favourable. Picking was completed in early August and marketing opened on 27th September and continued until the end of October. Recorded sales of cured leaf were 343,747 lb. of which 224,121 lb. were sold as Grade I. In 1953 287,836 lb. were purchased. The prices paid were 80 cents and 55 cents per lb. of Grades I and II respectively. The average yield per acre was 267 lb. of cured leaf which compares favourably with 229 lb. in 1953. There was, however, a big reduction in the amount of leaf sold illicitly outside the Protectorate in 1954.

No air-cured tobacco was grown in Acholi during 1954.

Flue-cured. (West Nile, Acholi and Lango).—In West Nile both early and late crops were planted as in previous years. Transplanting commenced

in the first week of April and continued until late August, with a break during the June/July dry weather. The number of growers concerned was 3,344 and the area planted was 1,503 acres. The early crop was adversely affected by dry spells in April and May but the later plantings were promising until the prolonged wet spell in August and September retarded ripening and caused a severe outbreak of "frog eye". Much of the leaf did not ripen properly and this, coupled with the disease, lowered grade seriously and the amount of unsaleable leaf was much higher than usual. The average yield per acre was 243 lb.

In Acholi where the crop is restricted to within a radius of 25 miles from Gulu, it was planned to plant at fortnightly intervals from mid-April onwards and to finish planting by mid-July. In the event it proved possible to follow the programme fairly closely, transplanting continuing from the first week of April until the third week of July. The number of growers involved was 1,546 and the area planted was 750 acres. The crop suffered from too much rain, particularly in August, and as in West Nile lack of sunshine resulted in a considerable amount of immature leaf, while "frog eye" took a heavy toll. Marketing continued from the third week of June until late October. The average yield of 208 lb. per acre of cured leaf is unusually low.

Progress in Lango was disappointing. Delay in opening land on the part of growers resulted in seedlings being overgrown when transplanted and later, when the land was ready, dry weather held up transplanting. Also, eelworm damage in one nursery restricted the supply of seedlings. The target was 150 acres but eventually only 84 acres were established. Some growers grew excellent leaf, but the majority were not really keen. As in other areas the crop suffered from lack of sunshine and attack by "frog eye". Yields were, however, higher than in Acholi and West Nile, the mean yield per acre being 245 lb.

Production figures for the province were: —

Area				Acreage		lb. of Green Leaf	
				1954	1953	1954	1953
West Nile	..	..	..	1,503	1,102	3,313,995	2,769,554
Acholi	..	..	..	750	625	1,366,627	1,368,916
Lango	..	..	..	84	51	177,190	162,674
TOTAL				2,337	1,778	4,857,812	4,301,144

Prices paid for the three grades were 10 cents, 8 cents and 3 cents.

COFFEE

Growers in West Nile continued to show increased interest in Arabica coffee growing, and supplies of seedlings were inadequate to meet the demand. There was an improvement in the standard of weeding. An equivalent of 4,670 lb. of rough hulled beans were purchased from the 1954 crop.

OILSEEDS

Sales of sunflower seed in West Nile were disappointing, only 91 tons being sold compared with 289 tons in 1953.

VI. Annual Report—Special Development Section

By R. K. KERKHAM, *Assistant Director of Agriculture (Special Development)*

MAIN LINES OF WORK

The Development Farm in Bunyoro in which the Protectorate Government is associated with the Bunyoro Native Government, Messrs. A. Baumann and Company and Messrs. Steel Brothers, continued a full programme of expansion. Main attention has been changed over to a tenant farming scheme.

The original organisation and objectives of the Busoga Development Farm have proved unsuccessful. The scheme was closed down at the end of September, and arrangements considered for running a settlement scheme in collaboration with a Government-run tractor hire service and an experiment farm.

Government tractor contract service units continued to operate in Buganda, Acholi, Lango, Toro and Bunyoro. The unit in Teso was virtually closed down owing to lack of interest. A small unit was started in Masaka.

The programme of these units was critically reviewed by the Productivity Committee. The Committee recommended that they should be continued on an experimental basis to obtain more information, and as a means of making farmers familiar with tractor work. The committee also recommended that arrangements should be made for farmers to take over running of their own machinery and establishment of additional training facilities.

Work has expanded on the two new management study farms at Butasindirwa in Ssinga and at Ssenge near Kawanda. These farms are already providing much useful information.

During 1954 more attention was paid to use of ox draught in association with tractor power.

In collaboration with the Entomological Section work was expanded on spraying cotton against *Lygus* in Acholi and Bunyoro, with promising results.

STAFF

The Assistant Director of Agriculture (Special Development) was in charge of the section throughout the year. The Agricultural Officer (Agricultural Engineering) continued field work in Acholi until the middle of the year, and was then transferred to headquarters at Kawanda. He took over charge of Ssenge Farm, and also assumed responsibility for machinery records. This experience is a necessary background for an Agricultural Engineer. For some time to come his work will consist of selection and minor modifications of existing implements, not in major problems of design.

One Senior Field Officer was in charge of tractor units in Mengo District. He was assisted by a newly appointed Field Officer who has taken over charge of the central workshop at Kawanda.

A newly appointed Field Officer took over charge of units working in Acholi and Lango and a Field Officer continued to work in Bunyoro. Part-time services of a Field Officer were obtained to start a small unit in Masaka District.

ECONOMIC CONDITIONS AND THEIR EFFECT ON MECHANISATION

Owing to a large increase in coffee prices during 1954 the main attention of all farmers in coffee producing areas was devoted to this crop. Cotton prices also increased, though to a lesser extent. Maize prices dropped from Shs. 38 per bag of 200 lb. f.o.r. in 1953 to Shs. 25 per bag in 1954. Tobacco prices were increased slightly in Bunyoro and Acholi.

In Buganda the main crop grown by mechanised farmers has been maize. The effect of price changes on production is normally not fully shown until farmers have sold a crop at the changed rates. Forecasts of price reductions or price increases have some influence on production, but have considerably less effect than the price they were last paid. The effect of the drop in maize prices was reflected by a reduction in the area sown in 1954, but the reduction has been greater in the area prepared for planting at the end of 1954.

By the end of 1953 a much more accurate assessment of costs of mechanisation was available than had been the case in former years. Rates charged for tractor hire by the department were increased, the largest increases being for small fields and scattered farms. Farmers who had purchased tractors in 1951 and 1952 were beginning to find that costs of tractor running over the first year of use bear little relation to true costs. The combined effect of stabilisation, or in some cases reduction, of crop prices and a truer appreciation of mechanisation costs has undoubtedly had a salutary effect on mechanised farming. The few farmers of Buganda who felt that purchase of a tractor would allow them to live in comfort whilst the profits rolled in have been sadly disabused. Attention has been focused on adoption of layouts which will allow economical tractor use, on training of efficient operators, on use of machinery only for operations which will repay its cost, and on the need to work out methods of harvesting and growing crops which will produce reliable yields. 1954 has been the first year in which development farms and farmers were able to look back and assess the results of new schemes and new ideas introduced in the immediate post war years. This assessment shows that mechanisation properly used has a useful part to play in farming development in Uganda, but its adoption must be integrated into a programme of more efficient use of ox draught and hand labour, and be accompanied by improvements produced by scientific study of disease and insect control, improved soil fertility and plant breeding.

STAFF TRAINING

The main need of this section of the Agricultural Department is instructors or assistant farm managers who can manage farms efficiently, give useful advice to mechanised farmers, and run departmental contract units. Existing staff of this type consists of three instructors, two assistant farm managers, four assistant farm managers on development farms and six supervisors with less prior training. In addition, six learners were in training. Wastage rate amongst this type

of learner has been high. Any considerable expansion must await additional training facilities.

Improved arrangements for training agricultural mechanics have been started during 1954 at Kampala Technical School, and for testing by the Trade Testing Organisation.

The standard of efficiency of tractor drivers on development farms shows real improvement. On contract units, and amongst African farmers, standards show little improvement.

AGRONOMY

Three small management study farms are now run by the Special Development Section in Buganda. The main objective of these farms is to find out systems of farm management which incorporate tractor use and which are likely to produce profits for group farmers or fairly large-scale individual farmers. At the same time, they provide opportunities for local trials and demonstrations of implements and equipment, and for trials suggested by farmers of the area. It is perhaps significant to note that farmers of south Kyagwe and Ssinga take considerable interest in activities at Kagongo and Butasindirwa, but few visit Ssenge. The latter perhaps suffers from close proximity to Kawanda. Farmers seldom feel that the farming of an experiment farm with close European supervision has any real application to their own conditions.

SSENGE

This farm was taken over in 1953. By the end of 1954 about 25 acres had been cleared with hand labour assisted by a half track tractor for pulling out trees and first ploughing. The average cost of clearing was Shs. 240 per acre.

The intention is to produce an annual crop rotation suitable for the area. During 1954 the main crops grown were cotton (10 acres), maize (five acres), sunflowers (five acres early and five acres late) and soya beans (five acres). In addition, small fields unsuitable for incorporation in the main rotation have been planted with sweet potatoes, cassava and beans.

Cotton picking has not yet been completed, but yields will not be high owing to poor growth in the early stages. Very satisfactory weeding was carried out with a Bentall disc ridger on a Fordson tractor.

Maize in an exceptionally dry year (total rainfall during the year was 31.71 inches only) gave a yield of about eight bags to the acre. At present prices maize cannot produce a profit when sold as grain. Some pigs have been purchased to see if feeding maize, sweet potatoes and other produce will produce a profit.

Neither the sunflower nor the soya crops grown in 1954 showed a profit. The first rains sunflower gave a yield of 800 lb. per acre, but this was insufficient to cover costs. Soya harvested at the end of the year was difficult to harvest, partly owing to uneven ripening, and the fact that harvesting overlapped cotton picking. It will be necessary to change the rotation on this farm in order to grow crops which supplement income from cotton whilst not competing with cotton for labour at picking time.

BUTASINDIRWA

Rainfall on this farm in 1954 was 31.83 inches, which must be a record low figure for the area.

Crops grown were similar to those of Ssenge, though some groundnuts were included.

The 1953/54 cotton crop was good, averaging about 1,300 lb. per acre on the June sown field and 680 lb. per acre from July plantings. *Lygus* spraying gave no response, nor did application of sulphate of ammonia to the late cotton.

Sunflowers from the late 1953 crop gave a yield of 460 lb. per acre. An early rains crop in 1954 was severely attacked by birds and produced 290 lb. per acre only.

Early maize in 1954 gave a yield of 10 bags per acre. Groundnuts suffered from wilt, particularly the B.239 variety. B.227 gave a yield of 1,000 lb. per acre (unshelled) and B.239 100 lb. only. Beans sown late in 1954 were severely checked by dry weather and produced 175 lb. per acre only. Harvesting of 1954-55 cotton has not been completed, but yields will not be more than 75% of the previous year.

A small herd of cattle introduced to this farm has done well.

Owing to high cotton yields this farm is likely to show a profit for 1954, but the problem of finding profitable crops to grow in association with cotton has yet to be solved.

KAGONGO FARM

Kagongo Farm in south Kyagwe is situated on "lunyu" soil, which has been identified by the chemistry section as due to manganese excess. It was started as a pasture sub-station. Crops grown are mainly for stock feed. At present the main problem is management of this difficult soil. The only crops yet tried which grow reasonably well without heavy manuring are maize and sorghum.

An experiment comparing use of farmyard manure and dung on bananas has as yet shown no difference between the two. On this soil heavy manuring soon after planting appears to be the only way of getting bananas to grow. Sweet potatoes have produced good yields after night paddocking.

The dominant natural grasses of this land are *Cymbopogon afronardus* and *Hyparrhenia diplandra*. Improvement work by various mechanical means has been tried, but none appears to be as effective as hand digging the tufts followed by burning.

A hammer mill was purchased during 1954 and made available for hire by local farmers. It was thought that lack of grinding facilities was a major deterrent to pig keeping in the area, where much maize is grown. So far response has been small.

Cattle on the farm had a poor year. Average live-weight gains of unweaned calves was 0.27 lb. per day, of heifers 0.25 lb. and of bullocks 0.28 lb. Average

milk yield of the nine cows was 26 gallons only. The herd was infected with trypanosomiasis during the year, which may be the cause. The Veterinary Department has arranged for regular injections. If this does not prove beneficial it will be necessary to investigate the possibility of a cumulative effect of living on a "lunyu" soil. In 1950-52 milk yields and liveweight gains were satisfactory.

DEVELOPMENT FARMS

Bunyoro Agricultural Company

Finance and Organisation.—The company carried out a very full programme of cropping on its own land, 683 acres of crops being sown in the first rains, and 356 acres in the second rains.

A first attempt was made to settle tenant farmers on land cleared by the company. Six men, chosen from the company's employees, started at the beginning of the year. Four of these worked as a group and the other two singly. All worked with their families; several employed some hired labour. They paid an annual rent of Shs. 30 per acre, and hired machinery from the company. All their produce was sold to the company. They grew 35 acres of tobacco, 46 acres of maize, 33 acres of cotton, 34 acres of finger millet and two acres of groundnuts. Their tobacco was very severely damaged by hail: the other crops produced satisfactory yields. The scheme was popular, and applications to enter the scheme at the end of the year exceeded the company's capacity to clear land.

Though the company's accounts are not yet available, it is clear that a very heavy loss will have been sustained on the year's working. The cost of crop production has been reduced, but yields of many crops have not been up to expectation. Administrative and overhead expenses remain high, and no considerable reduction can be envisaged without loss of efficiency. The tobacco crop is the only enterprise which can be expected to produce a profit capable of paying off an appreciable proportion of administrative expenses, but 1954 results were disappointing. The company is now considering ways and means of spreading administrative charges over a wider range of activities. Efficient skilled supervision is essential to such an enterprise: it is now clear that some of the profits of crop processing must be used to pay this supervision as well as crop production.

Farm Operations:

Weather.—46.6 inches of rain fell on 126 days. Sufficient rain had fallen by the end of February to allow ploughing to start. The usual dry spell in the middle of the year was absent, and in July when most of the crops were ready for harvesting, rainfall was 8.8 inches and there was practically no sunshine. The rain continued to be well distributed until the end of October, when three weeks of very hot dry weather occurred which was probably the cause of light crops at the end of the year. One hailstorm did considerable damage to the tenants' tobacco but did not reach the farm.

Land Clearing.—The Caterpillar D.4 and D.6 tractors continued clearing: 80 acres were completed on Kididima and about 100 acres felled on the new

mutalla for tenants. The D.4 was also sent up to Lango to do some experimental clearing.

Livestock.—A small herd of cattle was introduced to the farm in April, in order to find out whether they would survive and, if so, to increase their number considerably in following years. These would provide milk, meat and working oxen. As the area comes in the tsetse belt, injecting with antrycide was done every two months, blood slides being taken every month. The first three or four months showed some positive slides, but the last four months have been clear. The cattle have kept in very good condition and the calves have grown very nicely. The herd now consists of one bull, nine cows, three heifers, three yearlings and eight calves. In view of the fact that cows were mostly culls from Ngetta Farm milk yields were not unsatisfactory; the best cow gave 1,326 lb. in 231 days. The son of this cow has been kept for use as a herd bull.

Finger Millet.—187 acres were grown in the first rains and 117 in the second. Yields were 666 lb. and 650 lb. per acre respectively. The crop was harvested by combine, but difficulty was met in dealing with grass in the first crop when heavy rains occurred during harvest. This crop meets a ready market at 22 to 25 cents per pound.

Tobacco.—Tobacco beds were sited near two boreholes on the farm. On the first, germination was fair and on the second, very good. A plague of caterpillars, however, did considerable damage to a number of beds and the later heavy infection of mosaic in the field has been attributed to the fact that the disease was spread by the labour handling the seedlings whilst looking for them. An effective insecticide was eventually found but the damage had been done.

Approximately 160 acres of tobacco were planted out by the end of June on Kididima Farm and 28 acres on tenant lands. Planting conditions were not very good as rain was followed by bright sun which caused the seedlings to dry up and die. However, an 80% stand was obtained.

The first block became ready for picking towards the end of June when weather was wet and there was little sunshine; leaf had no chance to ripen properly. This adverse weather continued throughout July, causing the leaf to become rank and making curing much more difficult.

Total production was 20,000 lb. of cured leaf which realised Shs. 41,170 only. A high proportion of leaf produced was in grades 5 and 6.

Maize.—120 acres of Maratha were grown in the first rains and 18 acres of Yellow Maize in the second rains. Yields were 4.5 bags per acre. A fair response to sulphate of ammonia was obtained. The crop is used for feeding company labour, any surplus being sold as maize meal.

Groundnuts.—87 acres were planted, of which 49 acres were early and 38 acres were late. Good stands were obtained. The first crop gave a yield of 503 lb. shelled nuts per acre. Some loss took place as a result of difficult harvesting conditions. Several methods of drying in the field were tried, of which drying on tripods proved the most successful.

A Ransomes 24" Picker was tried out successfully with the second crop.

A small fertilizer trial indicated that application of superphosphate will pay. Yields from the second crop are not yet available.

Sunflowers.—An early crop of 32 acres gave a yield of 383 lb. per acre only. Bird damage was severe, and stooking at harvest was not entirely successful owing to damp conditions. A second crop of 100 acres was again subject to severe bird damage. Harvesting has not yet been completed.

Sorghum.—A successful crop was grown in the first rains, 34 acres of L.28 yielding at the rate of 1,440 lb. per acre and 12 acres of Dobbs at 3,300 lb. per acre. This crop was combined successfully. 15 acres grown in the late rains was very severely damaged by birds.

The market for sorghum is less reliable than for finger millet, but so far all has been sold at prices from 20 to 35 cents per pound; some remains unsold.

Beans.—Results have again been poor with both ordinary beans and soya beans.

Cotton.—Cotton was grown on a considerable scale at Kigumba for the first time. Farm cotton consisted of 41 acres of NC54 grown for seed increase for the Botanical Section. Though picking has not yet been completed, results are promising and an average yield of 700–800 lb. per acre of seed cotton is expected. A large response, probably not less than 300 lb. per acre, to spraying with D.D.T. insecticide is anticipated. Spraying cost was about Shs. 80 per acre. This work was supervised by members of the Entomological Section, who consider that a considerable reduction in cost can be made by use of less frequent spraying.

Water supplies.—Water supplies are now satisfactory. The two main boreholes were used for tobacco beds and are supplying water to labour lines, buildings, etc., without showing any signs of a diminishing supply. A 12,000 gallon tank has been built uphill from the Nyama borehole to supply tobacco beds in 1955. This will give some pressure at the beds and allow the use of hose pipes for watering. The tanks of the two dams were completely filled and some water accumulated in the dams themselves. The level of the Nyama dam has been dropping much more rapidly however than that of the Ntenyeke, and it is feared that water may be draining through a sand deposit at the base; it is probable that this will silt up after a year or two.

Workshops and Machinery.—There were no serious breakdowns during the year, only normal overhauling and repair of minor breakages being required. Tractors and machinery are now reaching the stage where they require more attention and we can expect higher repair and spares charges in the future. Full use has been made of the electric and gas welding sets.

Busoga Farms

Finance and Organisation.—The future of Busoga Farms has been the subject of consideration throughout the year. The 1953 balance sheet showed clearly that there is little hope of profits being obtained from a highly mechanised farm growing the normal crops of Busoga under expensive supervision.

During the first rains of 1954 about 450 acres were under crops. As from 30th September, 1954, the Busoga Farms organisation was closed down. Farming was continued on an experiment farm pending a decision as to future policy. A few cultivators were also allowed to farm on part of the estate with a view to starting a group farming settlement scheme.

Weather.—Total rainfall recorded was 50.95 inches at Ikulwe and 43.76 inches at Bwiwula. In general, weather was favourable for crop production, though continued overcast weather with showers made harvesting difficult in July and August.

Cotton.—97 acres harvested early in 1954 gave a yield of about 600 lb. per acre. Heavy blackarm attack on bolls made sorting very expensive. This crop showed a small profit on farm working account.

70 acres were grown in the 1954/55 season. This was of the N.C.54 variety grown by arrangement with the Botanical Section for increase purposes. Planting took place in late June and early July. Severe damage from American boll worm caused very heavy boll shedding, which was partially overcome by spraying with D.D.T. insecticides under the supervision of the Entomological Section. Labour shortage made weed control difficult.

Maize.—210 acres were grown in the early rains. Growth and stands were good, but severe damage was done before harvest by a hailstorm and by elephant. Yield was four bags per acre only which shows a loss of Shs. 185 per acre. Land preparation costs were very high owing to difficulty in getting rid of grass. Harvesting costs were also very high.

Soya Beans.—A crop of 37 acres harvested early in 1954 gave a yield of 780 lb. per acre. Receipts just about equalled costs. 23 acres grown in the first rains of 1954 gave a poor yield and showed a considerable loss. The main difficulty was harvesting in damp weather.

Sunflowers.—59 acres grown in the first rains of 1954 produced excellent growth, but harvesting was again very difficult, and yield was 500 lb. per acre only, which shows a heavy loss.

Groundnuts.—40 acres grown in the early rains also met with difficult harvesting conditions, and eventual yield was 512 lb. per acre of shelled nuts, and these were of poor quality.

Finger Millet.—37 acres grown in the first rains suffered severely from grass competition. The crop was combined and yielded at the rate of 900 lb. per acre. This is not unsatisfactory. The crop showed a loss mainly owing to high combine repair charges.

Sorghum.—70 acres of fatoon sorghum grown early in the year gave a yield of 710 lb. per acre. This will show a small profit, but produce had to be sold to a provender mill, as local demand was fully covered by normal supplies.

Livestock.—The cattle continued to keep in fair condition in spite of regular anttrycide injections. Several of the cows have now been injected monthly for 4½ years with no ill effects or no breakdown of resistance to trypanosomiasis.

Experimentally, two cows died after being allowed to go without injection for three months. The Veterinary Department supervises these activities.

Training of oxen for draught purposes was started in November 1954, with the loan of a stockman from Serere. They are now being used in carts, with considerable saving in transport costs.

The sheep continued to do badly and out of a flock of 100 50 have died.

The goats continued to thrive.

Contract Work.—Little attention could be paid to outside contract work during 1954, and only 55 acres were cultivated.

Group Farming.—58 acres were taken over by sixteen cultivators for cotton growing. Some have worked hard and done well, but this preliminary tryout has been of value in indicating the difficulties to be expected in starting a settlement scheme. Many farmers wish to come into the scheme; the chief difficulty is the introduction of a system of land tenure which will be acceptable to the traditional land authorities, who must be integrated into any scheme if planned settlement is to be evolved which can be extended into contiguous areas.

TRACTOR CONTRACT SCHEMES

(a) *Contract Work in Mengo District.*—As will be seen from the Appendix at the end of this section, the total amount of work done was about 30% less than in 1953. This was accounted for by the closing down of the uneconomic areas of Mawokota, north Kyagwe and Bulemezi and the fact that the expected reduction in the price of maize resulted in a lower acreage being grown mechanically. Work in Ssinga, however, was expanded and there was an increase of 125 acres of ploughing over the previous year. As before most of the work in this area was done for Co-operative Societies, who tended to consolidate their position rather than make a big increase in their acreages. The reduction in acreage in south Kyagwe was caused mainly by the drop in the price of maize. This action by the farmers was justified as the price of 6 to 9 cents per lb. which they obtained cannot give an economic return when mechanical cultivation is employed. West Kyadondo includes the north part of Busiro County as well; and the drop here is explained by the fact that this is a maize growing area. East Kyadondo which grows mainly cotton showed a small expansion of acreage. No work was done in Mawokota, north Kyagwe and Bulemezi as distance from headquarters, the scattered nature of the work, lack of supervision, malpractices and very poor tractor performance made running expenses prohibitive. It was therefore decided to close down work in these areas.

Tractors and Implements.—No new tractors were received during the year. The International Farmall B.M. continued to perform very well in Ssinga. Spares and repair charges were, apart from tyres, very low and fuel consumption of kerosene compared favourably with Fordson Perkins diesels on similar work. These latter tractors which are now all more than three years old showed high spares and repair charges in addition to the expensive major overhauls which were found necessary on several of them. Repair and replacement of fuel pumps and injectors are a big item under conditions where tractors work individually at

scattered points using fuel from drums. There is little doubt that this item can be substantially reduced on farms and other schemes where bulk fuel supplies can be used and better attention to filter maintenance is possible. The electric starting equipment also accounts for a lot of expenditure. Batteries have to be replaced at frequent intervals while starters, dynamos and the rest of the electrical systems are frequently subject to high repair costs. The Fergusons have continued to show fairly low repair costs and it is hoped that the substitution of magnetos for coil ignition will further reduce costs on the electrical side. It seems abundantly clear that in this country, where there is little difference in the cost of various fuels and the general standard of operations and mechanic's skill is low, there is little justification for the diesel tractor. The diesel may be justified on estate conditions, but for a contract service or for the individual African farmer, the kerosene or petrol tractor with magneto ignition appears much more suitable.

Ploughs.—The three-furrow semi-mounted HM150 disc plough used with the Farmall tractor continued to perform well. This plough is rigidly attached to the tractor at the front and the rear furrow wheel is permanently in the ground, lifting being done by a slave hydraulic cylinder. This type of plough seems to combine the advantages of the mounted plough in that it is held steady in work by the stability of the tractor, while not being fully mounted it can be made sufficiently heavy to do a good job in all conditions. The only disadvantage from a contract service angle is the lack of mobility of a self-contained outfit. The plough is too large and heavy to be easily loaded and off-loaded from a trailer, while it cannot be towed behind the trailer as in the case of a trailer plough. The Massey Harris 504 and Ransomes Dagoon trailer-type ploughs have continued to give satisfactory service although spares and repair charges remained high. The Ferguson ploughs continued to be cheap to operate and are practically unchokable.

Rotavators.—The Rotavator tractor attachments have shown that where used with discretion a satisfactory seed bed can be produced quickly. They are however very expensive to operate as spares and repair charges are high. The popularity of the Rotavator among farmers seems to have declined and many prefer an extra operation with a plough to rotavating.

Planters.—A Massey Harris 433 Groundnut Planter was obtained from Kongwa. This type of planter with Duplex seed cans containing two inclined seed plates is the only one which has successfully planted groundnuts here. The machine is a four row model and this was split into two. Half of it was converted for use with Ferguson linkage and sent to Serere, while the other two cans were fitted to a Massey Harris 66 two-row trailer planter frame which had been narrowed to plant 28" rows. This latter planter was used successfully for groundnuts at Butasindirwa, planting 28" rows with a high plant population at a seed rate of 65 lb. per acre. The remainder of the planting in the year was done by John Deere two-row trailer planters using a three-foot row width.

Farm Organisation for Tractor Use.—There has been little tendency for small African farmers to alter their layouts so that they could make increased use of tractors. Some of the bigger farmers have fairly good layouts but in many cases the presence of permanent crops or tenant cultivation has prevented

work being done. The most successful layout for tractor use has been by co-operative societies in Ssingo. Here societies have rented blocks of unoccupied land which have been ploughed and planted by our tractors. The area is then divided up according to the contribution to cultivation costs made by individuals who are then responsible for all subsequent attention and harvesting. They at the same time continue to run their own smallholdings with permanent crops in addition to the area they have in the mechanical scheme. The benefits of large acreage cultivation can thus be combined with individual small plot attention, and providing the society has a reasonably secure tenure and the individuals do not live too far away this system has much to commend it. One snag which appeared this year was that in the case of one society the individuals planted a variety of different crops on their allocated areas, which meant that subsequent tractor cultivation was not possible.

Cropping by Farmers Who Hire Tractors.—In south Kyagwe most farmers who have tractors grow one crop of maize a year and use very little hand labour. They often use three operations (two ploughings and rotavating) before planting by machine, and by thus ensuring a reasonably clean seed bed, weeding is usually not done at all. The weed growth is too late to affect yield but it means that the land is under a good cover of grass for four months of the year. In this way succeeding crops of maize may be grown on the same land without apparent ill-effects. The low prices obtained for maize in 1954 did not encourage even this comparatively cheap method of mechanised farming.

In Ssingo (Hoima road area), however, more land was ploughed for cotton than other crops, and although this was the initial crop in some cases, in others sunflower was planted first. The sunflower although apparently successful at first seems to depress the cotton yield so much as to make it not worth growing.

The Kyamalansi Co-operative Society have undoubtedly made a success of their well laid out strips and have obtained yields of cotton averaging 800–1,000 lb. per acre and maize 2,000–3,000 lb. per acre. The societies in the Mityana area grew mainly maize but they did not have such a successful year owing to the difficulty of selling at an economic price, and there was a fair amount of maize still unsold at the end of the year.

Tractors Owned by African Farmers.—Increased attention was paid to advisory services for African tractor owners. Few farmers so far are making a profit from tractor use.

Spare Part and Maintenance Facilities.—There is little change to report under this head during the year. One main firm has maintained an adequate spares and repair service, while the service of others, although improved somewhat, is still not really sufficiently alive to meet their responsibilities in this matter. Other firms and agencies do not have spares, stocks, or trained servicemen in Uganda and even the smallest spare part has often to be ordered from Nairobi with consequent delay in supply. This is particularly annoying to owners of single tractors, but seems unavoidable unless the tractor population increases substantially or the agents are prepared to lay out capital without the prospect of immediate financial return.

(b) *Acholi/Lango—Contract Work and Performance.*—Six tractors were based on Gulu working in Acholi and three were based at Anyeke working in Lango. Operations were completed in Lango early in August but as there was no demand for any off-season work the tractors were withdrawn. By the end of August nearly all contract work had been completed in Acholi, but there was quite a demand for off-season work, mostly transport, with the result that five tractors were left working throughout September, October and November and six in December.

Work done by these nine tractors is shown in the Appendix at the end of this section of the report.

Costs of running these tractors were: —

						Cost	Cost per hour
						<i>Shs.</i>	<i>Shs.</i>
Fuel and Oil	..	..	..	..	..	38,802	5 44
Drivers' Expenses	..	..	..	..	..	13,195	1 85
Mechanics, spares and repairs	..	..	..	..	..	25,111	3 52
						77,108	10 81
Supervision—							
Plot Measurers	..	..	..	..	..	8,869	3 71
European Supervision	..	..	..	..	..	17,594	
Depreciation	..	..	..	..	..	30,508	4 28
TOTAL ..						<i>Shs.</i> 134,079	18 80
TOTAL REVENUE EARNED WAS SHS. 77,333/61.							

During the year it will be seen that revenue earned was equal to the tractor running costs, but did not cover supervision or depreciation. This result is an improvement on previous years. Some additional improvement can be anticipated through increase in hours worked per tractor per year and by improved performance, in particular by scrapping the rotavators which are much the most expensive implements to work.

All tractors used were Ferguson petrol tractors. Performance of these tractors and their two disc mounted ploughs was satisfactory. Rotavators, the Krause mounted disc tiller and the Ferguson mounted offset disc harrow were used for second operations. The offset disc harrow is considered the most satisfactory of these implements.

Group Farms.—Formation of groups for tractor use has continued, 18 groups had work done in Lango and 19 in Acholi. In addition, work was done for four individual farmers. Generally speaking, organisation of groups was more satisfactory in Acholi than in Lango.

The present system is for groups to expand acreage and membership until they have about 20 acres cultivated. They then tend to split into sub-groups, retaining a membership of 10–15. Larger groups tend to become unwieldy, and encounter difficulties in collecting moneys and arranging for work. A survey of requirements for 1955 shows that requests, without going into new areas,

exceed 3,000 acres. There is therefore no doubt of the popularity of this service in this area.

Cropping.—In Acholi 580 acres were cultivated mechanically and crops grown were cotton 312 acres, simsim 66, finger millet $61\frac{1}{2}$, tobacco 57, finger millet followed by sorghum $26\frac{1}{2}$, beans $21\frac{1}{2}$, groundnuts 20, cassava 3, tobacco followed by cotton $2\frac{1}{2}$, sunflower $2\frac{1}{2}$, groundnuts followed by cotton 5, maize 2 and sweet potatoes $\frac{1}{2}$.

In Lango 304 acres were cultivated and crops were cotton 167 acres, tobacco followed by cotton $51\frac{1}{2}$, simsim 36, tobacco followed by simsim 19, tobacco 27, finger millet 2 and groundnuts 1.

In general tractors were used mainly for cash crops, the most important being cotton and flue-cured tobacco.

In the case of cotton it is difficult to believe the local opinion that ploughed land gives better crops than that cultivated by hand. Farmers who use tractors tend to be the keenest cultivators and get their crops planted in good time, and perhaps give more attention because they have paid out money for cultivation. Experimental tractor spraying for *Lygus* control has shown satisfactory yield increases.

In the case of tobacco, improvements of yield following use of tractors may well be a genuine result of deeper cultivation. Use of the disc ridger also appears to have a beneficial effect.

Land Clearing.—Several groups in Acholi hired hand winches for land clearing.

An experimental bush clearing scheme with a Caterpillar tractor was carried out at Alito.

The area concerned contains a high density of small trees. Farmers had tried hand winches, but had found the use of hand operations too slow to allow them to make effective use of tractors. Clearing was done by a Caterpillar D.4 tractor by the Bunyoro Agricultural Company. Costs of felling alone, including full operating costs, depreciation and transport, but not European supervision came to Shs. 126 per acre for felling alone, or Shs. 210 per acre for felling and windrowing. Farmers have agreed to repay costs of felling over two years.

General.—Results obtained from mechanical cultivation in Lango and Acholi during 1954 were promising. Farmers concerned have little commercial or mechanical knowledge, and it will be some time before they are in a position to operate their own machinery, though one large individual farmer is considering purchase. Very considerable progress has been made in adoption of improved farming layouts which are suitable for tractor use.

(c) *Bunyoro.*—Contract work was carried out under the supervision of a Field Officer in five gombololas of Bunyoro during the first six months of the year. Work done is shown in the Appendix. Six tractors were used, though not for the whole of the period. In all, work was done for 29 groups or indi-

vidual farmers. The total area opened was 398 acres. The following table shows size of groups in relation to acres cultivated mechanically.

SIZE OF GROUP No. of male members in the group	No. of groups	Average No. of male members	ACREAGE CULTIVATED	
			Total	Average acreage per group
Less than 5	7	1.9	71	10.1
5 but less than 10	4	5.7	27	6.7
10 but less than 20	17	12.2	236	13.9
More than 20	3	21.3	43	14.3

This table includes two groups for whom work was done in 1953 but not 1954. The table gives a fair indication of the type of group for whom work was done. The "less than 5" groups are family farms run by energetic farmers who probably employ a few porters. The main type of group has 10 to 15 members. They run a co-operative farm of 10 to 20 acres, but in addition have their own holdings on which they grow their food. Four of these groups have recently been registered as co-operative societies, others are intending to be registered.

The main crops grown by these groups were cotton and fire-cured tobacco. Trials with control of *Lygus* were made by the Entomological Section on one group farm, in this case with hand operated machines. Use of tractors undoubtedly gives a chance of getting better yields of fire-cured tobacco. This crop is frequently grown on land after opening from grass, and early planting gives the best yields. This requires first cultivation in the period December to February, which is a very laborious process by hand labour, and also coincides with the maximum pressure on hand labour for cotton picking. Maximum use of tractors for early opening has so far been held up by lack of cash until cotton is sold. Facilities for obtaining short-term credit are required in order to allow these groups to expand farming activities at a reasonable rate.

Finance.—Tractor operating costs and revenue earned are shown below. The unit is too small as yet to be economical, but results are promising.

	Cost		Cost per hour	
	Shs.	cts.	Shs.	cts.
Fuel and Oil	9,380	25	5	45
Drivers' Expenses	6,975	55	4	05
Mechanics, spares and repairs	2,574	05	1	50
Total	18,929	85	11	00

Total revenue earned Shs. 23,850 = Shs. 13/86 per hour.

The figure given for mechanics, spares and repairs is too low. Tractors were changed over and major overhauls not charged to this unit.

Land Clearing.—All groups are working in country carrying heavy bush, and clearing limits the rate at which they can expand. Some use was made of hand winches and Shs. 368 collected as hiring charges at Shs. 4 per day.

Several of these groups were discouraged by severe game damage to crops. This matter has been taken up with the District Administration.



PLATE I

The Allmans Universal sprayer mounted on a Ferguson tractor fitted with wheel-guards to prevent damage to the cotton plant while spraying against *Lygus*.
[Photo by Mr. W. R. Ingram]



PLATE II

Three of the many hand-operated sprayers and dusters tested at Serere for use against *Lygus* on cotton. *[Photo by Mr. W. R. Ingram]*



PLATE III

The semi-range herd at Serere on a third year *Chloris* ley used as a night paddock, and still containing 90% of the sown species. Photo was taken during the dry season.
[Photo by Mr. W. R. Ingram]



PLATE IV

A demonstration of an ox-drawn disc harrow with a team of eight oxen.
[Photo by Mr. W. R. Ingram]



PLATE V

New modern 40 gin ginnery at Kireka. [*Information Department photo*]



PLATE VI

Rebuilt ginnery at Kiriri, Gomba, Mengo. [*Information Department photo*]



PLATE VII

Terrace formation by bunding, Gomba, Mengo. [*Information Department photo*]



PLATE VIII

Terrace formation by bunding, Gomba, Mengo. [*Information Department photo*]



PLATE IX
Hillside bunding at Butambala. [*Information Department photo*]



PLATE X
Soil and water conservation, Kyagwe, Mengo. [*Information Department photo*]



PLATE XI

Hoeing of weeds into rows on the contour, Gomba, Mengo.
[Information Department photo]



PLATE XII

Mulching of coffee with elephant grass, Buyaga, Mubende.
[Information Department photo]



PLATE XIII

Good cotton crop planted in young banana garden. Also note drying table in forefront, Butambala, Mengo. [*Information Department photo*]



PLATE XIV

Presentation of shields and prizes, Butambala, Mengo.
[*Information Department photo*]



PLATE XV

Mulching of banana garden with sorghum straw, Gomba, Mengo.

[Information Department photo]

(d) *Masaka*.—A small contract unit was started in Masaka early in 1954 with one Ferguson tractor working for the ex-soldiers settlement scheme at Bukango. This work was financed by a loan from the British Legion. Members have formed themselves into a co-operative society, and have received much assistance from the Co-operative Officer at Masaka. Layouts consists of about 2,000 acres of land divided into 15-acre soldings. This layout is not really suitable for use of either tractor-drawn or ox-drawn implements, but a number of owners arranged to join their holdings together for tractor use, and 64 acres were eventually ploughed. Most of them planted cotton on this land.

Considerable interest was aroused in tractor use as the result of this scheme. Work was done for two large farmers, both of whom wish to plant coffee.

In general, experience in Masaka indicates clearly that there is no real need to run a large government contract scheme. Four African farmers in Buddu County already operate their own tractors. The main demand is for machinery to help with opening up farms in the thinly populated country of north-west Buddu and south-east Mawogola counties. These farms will be planted with coffee, bananas and eucalyptus. Farmers in general have access to mechanical and commercial knowledge. The main requirement is more advice and additional training facilities. Contract work is only required in order to give machinery a thorough trial under local conditions, and to allow farmers to see tractors working under conditions similar to their own.

In addition to contract work, some experimental work was done on Kamenyamigo Farm, mainly with a Ransomes M.G.5 tractor pulling a disc harrow in coffee. This tractor appears to be underpowered at this altitude.

(e) *Toro*.—Three Ferguson tractors continued to do some work in Toro, mainly in Busongora in association with a settlement scheme. Efficiency was poor and repair charges high owing to inadequate supervision. Arrangements are being made for a Field Officer to assist with running of tractors in this area.

(f) *Teso*.—One Fordson kerosene tractor did a little contract work round Serere. In previous years more work had been done, but increase in hire charges appears to have persuaded Teso farmers that oxen are cheaper for cultivation, and equally effective. It should be borne in mind that little additional land is available in this area, and that few farmers have an opportunity to increase farm size by tractor use, and that all farmers have ready access to ox ploughs.

ACKNOWLEDGEMENTS

Acknowledgements are made to members of the field staff, development farms, experiment farms, Namulonge, and the Veterinary Department who have assisted with compilation of tractor performance records. Their assistance has allowed the section to compile factual records of a scope available at few other centres.

New arrangements for stationing members of the Accountant General's staff in out-stations have been a great help to Field Officers. Their assistance is acknowledged with thanks.

Very useful advice and assistance has been obtained from the Technical Secretary of the Colonial Agricultural Machinery Advisory Council.

Constant advice and assistance has been obtained from the scientific staff of the department.

CONTRACT WORK, 1954

Area	Plough			Rotavator, Disc Harrow, Disc Tiller			Planter and Drill			Hired transport	Other Operations	Operational transport	Total
	Hr.	Ac.	Hr./Ac	Hr.	Ac.	Hr./Ac	Hr.	Ac.	Hr./Ac				
Mengo—													
South Kyagwe ..	1,204	369	3.26	176	92	1.91	51	63	0.81	111	85	283	1,909
Ssingo ..	1,714	651	2.63	233	150	1.55	171	186	0.92	51	—	128	2,298
East Kyadondo ..	1,029	435	2.37	12	4	3.00	31	40	0.76	42	97	18	1,229
West Kyadondo ..	734	286	2.57	33	24	1.35	5	9	0.58	1	—	21	1,793
TOTAL MENG0 ..	4,681	1,741	2.69	454	270	1.68	258	298	0.87	205	182	450	6,229
Masaka ..	936	304	3.08	51	58	0.88	—	—	—	—	—	29	1,016
Acholi/Lango ..	4,383	1,525	2.87	671	346	1.94	19	17	1.13	1,390	67	582	7,112
Bunyoro ..	1,111	535	2.07	180	100	1.80	—	—	—	—	—	430	1,721
Toro ..	523	149	3.51	333	148	2.25	—	—	—	—	—	130	1,986
Teso ..	161	85	1.89	38	32	1.19	7	10	0.70	12	—	36	254
TOTAL CONTRACT WORK	11,795	4,339	2.72	1,727	954	1.81	284	325	0.87	1,607	249	1,657	17,318

VII. Annual Report—Serere Experiment Station

By D. J. PARSONS, M.C., *Officer-in-Charge*

INTRODUCTION

The past year has in general been one of consolidation rather than a year of spectacular new programmes. The majority of the agronomy experiments had come to a close or were at a stage where summaries and analyses of past results were essential in order that future development could be based on a foundation of fact rather than hypothesis. The summarising of past grazing experiments was completed and analyses of the soil fertility experiment and the permanent manurial experiment were carried out. It is with these results as a basis that new work has been planned for 1955.

With the posting of a second Agricultural Officer to the staff, new work on grasses and legumes was started up during the year, and towards the year's end the arrival of an Entomologist has further widened the scope of work planned.

The present departmental staff at Serere number seven European officers and four Assistant Agricultural Officers. This, compared with the establishment of two European officers and three Assistant Agricultural Officers in 1948, would indicate an increase in the scope of the work carried out on the station during the last few years. However, perhaps the most important outcome of 1954 has been the reorganisation of the research sections of the department combined with the activities of the Productivity Committee, which together have given every hope that the scope of our work will be enlarged much further in the future. It is, I think, true to say that in the past much of the potential value of Serere as a station has been lost to the country due to lack of staff. Here we have the largest experiment station in the department, of nearly 1,700 acres, dealing with problems affecting the agriculture of the short grass ecological zones of the Protectorate which comprise nearly the whole of the Eastern and Northern provinces and parts of the Western Province. Serere, adequately staffed and financed, can and will do much more for the welfare of this country when the plans put forward during 1954 come to fruition.

METEOROLOGY

The total rainfall for 1954 at Serere amounted to 49.62 inches. Figures for previous years are given for comparison in inches.

TABLE I

1954	1953	1952	1951	1950	1949	1948	1947	1946	1945
49.62	45.93	55.94	59.39	45.09	48.64	55.62	45.25	58.45	57.08

Average annual rainfall since 1921, i.e., for 34 years, is 53.36 inches.

Distribution was bad and conditions for late sown crops very dry. A record monthly total of 14.45 inches fell during May, preceded by falls totalling 3.80 inches in the last three days of April. Much of this rainfall was lost to the soil reserves due to run off and panning of the surface soil resulting in much standing water and consequent loss by evaporation. Following this 22.65 inches only fell during the last seven months of the year from June onwards, some nine inches less than normal. There was no secondary peak of rainfall during August and September as is usual at Serere, and true dry season conditions set in early in November during which month only one shower of 0.80 inches fell on the 28th. This was followed by a few light showers in December amounting to 2.20 inches in all, too late to do anything but interfere with cotton picking and spoiling grade.

Although the rains did not start until the beginning of April, the overall effect of the year's weather was to produce bumper spring crops following the very wet month of May, and to make the planting of any second crop uneconomic due to very poor yields following a dry back end.

The following table gives a comparison of the year's monthly falls compared with the 34-year average since 1921.

TABLE II
MONTHLY RAINFALL FOR 1954 WITH THE AVERAGE MONTHLY RAINFALL FOR
34 YEARS 1921-1954 FOR COMPARISON.

	1954	Average 1921-54
January ..	0.08	0.76
February ..	0.96	2.13
March ..	1.70	3.52
April ..	9.78	8.13
May ..	14.45	7.51
June ..	4.32	4.30
July ..	3.90	4.75
August ..	4.37	6.47
September ..	4.26	5.76
October ..	2.80	4.35
November ..	0.80	3.57
December ..	2.20	2.10
TOTAL ..	49.62	53.36*

*The total disagrees with the sum of monthly averages due to rounding off.

The work of the Botany, Chemistry and Entomology sections is reported elsewhere.

FARM CROPS

(a) *Cotton*.—The early months of the year saw the completion of harvest of the crop planted in 1953. Final yields were disappointing, averaging 590 lb./acre of seed cotton over all fields. Previous years' average yields are given for comparison.

TABLE III

	1953-54	1952-53	1951-52	1950-51	1949-50
Average Seed Cotton Yields lb./acre	590	748*	706	500	559

* Record yield

The highest individual field yield was 1,024 lb. seed cotton/acre planted in mid-June and the lowest field recorded 215 lb./acre being late planted cotton following a spring crop.

Planting of the 1954/55 crop started on the 11th June and was completed by early July. Cultural details are given on page 99 of this report. All seed was dressed against blackarm disease (*Xanthomonas malvacearum*) with *Perecot* 45 and all fields were utilised by the Senior Entomologist for spraying trials against *Lygus*.

Initial growth was good but most of the east and central farm cotton was very badly damaged by hail during August. This, together with a very dry back-end of the year, has reduced yields considerably. At the end of the year the picking of this crop is not complete but it is doubtful if the average yield from all fields will exceed 500 lb. of seed cotton per acre. Once again, however, the highest yielding field has given over 1,000 lb. of seed cotton per acre. This was a sprayed field which was not damaged by hail.

The object of the main farm cotton crop is to increase seed of selected varieties. This year the varieties planted were DE715/6, DE715/6M and S9395.

(b) *Finger Millet*.—Only one field got away with the grass rains at the end of February, this field finally outyielding all others. The rest of the crop did not germinate until the main rains arrived in early April and was consequently late. However, 1954 with record May rainfall was an extremely good year for “wimbi” both on the farm and in the district. All the main farm crop amounting to nearly 40 acres was harvested by combine and yields varied from just under one ton of grain per acre to 1,311 lb./acre of grain, giving an average yield off all fields of 1,663 lb./acre grain. Only once before has the combine harvested our “wimbi” crop and then, in 1953, the average yield came to but 848 lb./acre of grain. These yields converted into the equivalent weight in dried heads compare with previous yield figures as under:—

TABLE IV
SERERE *Eleusine* YIELDS LB. OF DRIED HEADS/ACRE

1954	1953	1952	1951	1950	1949	1948	1947	1946	1945
2,217*	1,131	853	928	1,119	1,058	2,204	1,459	1,654	1,325

* Record yield

In 1948 the May rainfall was 14.26 inches, the highest monthly figure recorded until May of the present year. A significant correlation can be demonstrated between the yield of *Eleusine* and rainfall in May (probability less than 2%).

In a very heavy crop of this nature the limitation of a machine such as our combine which is manufactured mainly for the harvesting of somewhat larger grains, becomes apparent. Quite a large amount of grain was lost through “bursting of the seams” of the machine which turned out to be anything but “wimbi tight”. Further details of this and other cultural operations are given under the section on machinery on page 99 *et seq.*

Many blind "fingers" were carried on the crop on the 20 acres. This proved to be due to Blast (*Piricularia oryzae*) and the attack was the severest that has occurred for many years.

One field of five acres was planted in late August as a trial. Growth was moderately good and combining in December took place under ideal conditions but the yield was only 157 lb./acre grain.

(c) *Sorghum*.—Sorghum is grown for two purposes on the farm. The spring crop on the west farm is cut at first flowering and ensiled in pits. The main grain crop is grown on other sections of the farm in the late rains so that the carry-over of pests from spring to autumn crop should be minimised. Due mainly to the high April and May rainfall the silage crop cut at 25 tons/acre green matter, double the usual yield. After the two pits were filled the surplus leaf was ensiled in a stack and protected by mud and wattel sides. This eventually produced good silage. The autumn-sown grain crops however yielded very poorly. Three main varieties were planted—L28, L31 and T15.

Yields were as follows:—

L28 229 lb./acre dry heads.

L31 229 lb./acre dry heads.

T15 431 lb./acre dry heads.

These poor yields can be attributed in the first place to a very severe (90%) infestation of stem borers. Sorghum shoot fly was observed also, together with a host of minor pests. Secondly, the back-end rains were deficient. Thirdly, what little crop remained when dry weather conditions set in in November was further depleted by the usual invasion of weaver birds and doves. This is the second year running that the autumn grain crop has failed. When grown in the spring however sorghum can yield very heavily at Serere and it would appear that it would be more profitable to transfer all sorghum plantings to the spring. However, whereas there is a multiplicity of spring crops to hand, sorghum has always been counted one of the few crops able to yield something in the late rains. It would appear that under farm conditions when planting is carried out in larger fields than is common in the district, insect and bird pests make the late crop hopelessly uneconomic. This discussion is taken up again later on page 94.

(d) *Groundnuts*.—For the first time at Serere this crop was planted mechanically. Due to insufficient knowledge of the planter the stand at 28" spacing was gappy and only the very wet conditions of late April and May allowed us to escape severe losses from *rosette* disease. Even though growth of individual plants was excellent, the low seed rate and the serious depredations of the red Teso ground monkey gave a very poor average yield of 441 lb. unshelled nuts per acre. The highest yielding field (C1 Training Farm), which was hand planted, only yielded 965 lb./acre so that 1954 cannot be considered a good groundnut year. In a good year 1,500–1,700 lb./acre are harvested. This is a crop which is subject to much loss at harvest as it is harvested in a readily consumable form, and true yields are probably higher than our records show. Much was also lost after harvest this year due to very wet conditions making drying difficult. Trials of stooking the nuts both with haulms outwards and haulms downwards did not help and under these wet conditions the stooking of

plants with haulms upwards proved very wasteful. This remains a very labour consuming crop at harvest and for this reason the local variety "Busoga bunch" is always grown on the main farm since it is easy to pick, in preference to the higher yielding introduced B types.

(e) *Pulses*.—Cow peas are the main second rains pulse crop in Teso District and are grown extensively as one of the few crops able to yield regularly under the uncertain conditions of rainfall. However, the complete failure of this crop in 1953 was followed this year by very poor yields once again, only 152 lb./acre being harvested. Green grams were once again tried as an alternative but fared no better, yielding on the average only 112 lb./acre. Tepary beans are now only planted as an inter-row crop with root crops as their low yield in most years makes the planting of a pure stand uneconomic. This is a very short-term bean maturing at from 6–8 weeks under good growing conditions and is useful as a catch crop or intersown. Its yield of 234 lb./acre during 1954 was not unsatisfactory under the circumstances. These pulse crops were planted both by hand and mechanically, and of the two methods mechanical planting was found to be preferable due to easier weeding.

(f) *Sunflower*.—This crop is not commonly grown in the district and this is only the third year in which it has been grown at Serere. We are now getting some idea of its capabilities under our conditions. Experience during 1952 and 1953 showed it to be a possibly very valuable late rains crop as it yielded over 600 lb. of seed per acre in 1953 under conditions which caused all local pulse crops to fail completely. During 1954 it was also tried as a spring crop to get some idea of its yield potential under better conditions. Two fields were drilled on the main farm east and from the first germination and growth were excellent. The very wet conditions in May produced excellent vegetative growth and finally 1,233 lb. per acre of seed was harvested. Here again much was lost due to rotting at harvest when conditions were still very wet, but loss due to birds was negligible. With present prices even this order of yield does not make sunflower a very remunerative crop. Its value may lie in its ability to produce regularly as a late rains crop. This ability is not yet proven, however.

(g) *Sweet Potatoes*.—A large acreage was planted this year, starting from the month of May and continuing through to August. At the time of writing the May planted fields have yielded $4\frac{1}{2}$ tons of tubers per acre which is an improvement on the past few years. Indications are however that yields will drop steeply on the later planted fields. No serious attacks by pests were experienced and at the end of the year a large area of swamp planted vines ensures sufficient planting material for next year.

(h) *Cassava*.—Once again much of this root crop has been lost by theft. Pigs and monkeys as well as human beings look upon the main farm cassava fields as a larder conveniently remote from supervision from which much-needed food can be obtained for the digging. The only fields to be harvested by the end of the year were on the west farm where soils are good and yields were in the region of six tons per acre. This is not an ideal crop for inclusion in a rotation and experience indicates that it is best grown in special fields situated somewhere close to the homestead where theft can be controlled and carting is easy.

(i) *Fruits*.—The two citrus orchards were maintained and good crops of grapefruit and sweet oranges were produced. It is believed that all trees are infected with quick decline virus. The usual seedling issues took place. It is planned to extend horticultural work on the station during 1955 when it is hoped to start budding.

A new banana plantation was planted in August and has taken very well. It will be used for trials with various cover crops in comparison with the usual mulching treatments.

AGRONOMY

(a) *Soil Fertility Experiment*.—This classical experiment containing 450 plots which was started in 1936 has now completed three five-year circuits on each of its five cycles, and the results obtained so far have been analysed by the Chief Research Officer who comments as follows:—

The following main effects maintain or increase fertility:—

Natural regeneration.

More than one year's rest (in a five-year rotation).

Five tons of farmyard manure per acre applied every fifth year.

The following differential effects were noted:—

Two years rest under natural regeneration is ample. With the other resting treatments (which include a *Chloris* ley grazed and ungrazed and green manures) three years are more effective.

The manurial treatments have less effect on the grazed treatment.

It was noted that better crops have been raised on plots containing old ant heaps.

These conclusions reduce to one dominant theme, namely the mobilisation of plant nutrients. There is no evidence as to which plant nutrients are critical. This experiment poses a question the answer to which is fundamental to our understanding of soil fertility. Clearly, this question must be referred to the Chemistry Section, and much work in the department will wait on the answer.

The experiment continues.

(b) *Permanent Manurial Experiment*.—This experiment was started in 1933 to compare the effects of dressings of farmyard manure and lime as a measure for the retention of soil fertility under a system of continuous cropping. The rotation is one of three years with the manure and the lime being applied once during each rotation. 1954 saw the completion of seven circuits of the three year rotation and results to date were analysed by the Chief Research Officer, who comments as follows:—

These show that:—

All crops respond to farmyard manure. Cotton does not respond to lime, but the millets and groundnuts do.

The following table displays, in pounds per acre of air-dry matter removed from the land, the mean triennial increases or decreases over the period.

TABLE V

Control	..	-154	Continuously cultivated no manures.
Lime 2 tons/acre	..	-121	
FYM 10 tons/acre	..	-6	
FYM 20 tons/acre	..	26	
FYM 30 tons/acre	..	59	

The circumstances of this experiment are very different from those of the soil fertility experiment, which is proof against erosion. This experiment is on a sloping site and a good deal of erosion has taken place. Under these conditions it takes more than 10 tons/acre of FYM, applied every three years, to maintain fertility under a system of continuous cultivation.

Detailed analysis reveals three additional points:—

(a) Seasonal fluctuation in yield is much less severe when 30 tons of farm-yard manure are applied.

(b) Neither finger millet nor sorghum appears to be capable of sustaining its yield when grown at regular intervals under the conditions of this experiment.

(c) The yield of groundnuts on the other hand is maintained throughout the period.

This experiment also continues.

(c) *Pasture Agronomy*—(By D. J. PARSONS and C. R. HORRELL).—The posting of a new Agricultural Officer to Serere in February allowed a considerable expansion of pasture work to take place. During 1954 an area was set aside as a grass farm and the layout of this has progressed rapidly.

Chloris gayana, at present the only grass in use, is not entirely satisfactory on its own. In fact, no single species of grass grown by itself can be expected to perform the full functions of a ley—namely, to provide abundant grazing of high quality for all the months of the year, while at the same time building up soil fertility.

That Rhodes grass alone is not a rapid fertility builder is shown by the results of the soil fertility experiment. Neither is this anything but what one would expect.

Our aim must be to produce a mixture of grass species for seeding as leys which will not only give a prolonged growing season but also a range of root horizons to ensure soil amelioration and nutrient tapping at several depths. Ideally nitrogen fixing legumes should be combined with this mixture to increase the growth and quality of the grass, which will allow higher stocking rates, increase the rate of turnover of nutrients and so speed up the process of raising fertility status.

For, the present, at least, Rhodes grass may be expected to form a good base upon which to formulate a seeds mixture. Other grasses which can be seeded at present include *Melinis minutiflora*, *Cenchrus ciliaris* and *Hyparrhenia rufa* and these among others are now being investigated with this object in view.

A new introduction area was laid out and following a visit to the Kitale grass-land station in Kenya a number of grasses and legumes were introduced and planted in the nursery. In all, 32 grasses and 42 pasture and fodder legumes were introduced from Kitale and other parts of the world during the year. As far as the grasses are concerned we intend to concentrate mainly on indigenous species and endeavour by selection to produce strains of the local grasses selected for definite characters which will increase production either for grazing or

fodder. Although past records tell us that many of the legumes introduced during 1954 have been introduced to Serere previously and have not succeeded, nevertheless we feel that their reintroduction will serve a purpose if, in the light of experience at Kitale and other places, they can be helped on their way by proper care and attention. Accordingly, all introductions have been sown or planted with a dressing of phosphate on the seed bed, and as far as possible all legumes have been inoculated and the seed coat of hard seeded varieties scarified. Local species are also under test. We have already found that these treatments rather alter the picture and that many of the legumes now growing show quite a high degree of promise.

We aim during 1955 to seek suitable pasture legumes and to determine whether these legumes will fix atmospheric nitrogen not only to the benefit of subsequent cropping but also to the increase in production of the grasses growing with them.

At the same time, work must continue on the most important subject of seed testing. Poor seed germination is the biggest factor limiting the use of several desirable species of local grasses in ley mixtures. Investigations on a small scale were begun during 1954 on the amount of seed set and the percentage of pure germinated seed obtained from monthly collections from various species throughout the year. Indications from this are that there are good and bad months for seed collection, but more work is necessary before any conclusion can be drawn. The effects of periods of storage of seed on germination were also tested. The whole technique of seed testing was studied at the Scott Laboratories in Nairobi and future work should proceed on a sound basis.

On the grass museum observations have been made on earliness, growth, drought resistance, time of flowering and seeding and rate of recovery after cutting and burning many local grasses.

The new grazing area, some fifty acres in extent, which was set aside for the grazing experiment described in last year's report was sown to *Chloris gayana* during the year and a satisfactory stand has resulted. Since this experiment is in abeyance the whole area was grazed and subsequently cut for hay. This was made satisfactorily following experience gained earlier in the year from west farm where a good sample was produced. The whole operation was carried out by hand and ox rake and the entire process from cutting to stacking occupied only 1½ days.

Block III Old Farm was sown to single species and various mixtures of grasses for observation under grazing. Some of these mixtures included a small proportion of *Eleusine* millet which successfully gave an early bite and served as a suitable nurse crop. Phosphate was applied to the seed bed in bands and produced a marked effect in establishment.

The rotational grazing of the *Chloris* leys on the experiment farm at the rate of one half-grown beast per acre continued up to the last few months of the year. However, it then became apparent that the production from the second and third year fields was very low and the stocking rate has been reduced to 20 beasts on the 30 acres. For many years we have carried a beast per acre on this farm but always with the introduction of silage during the dry season. An

attempt was made during 1954 to conserve some of the wet season herbage as hay for feeding back during January and February 1955. However, surplus production during the wet season was sufficient only to produce a very small hay crop. It would appear that these leys having been very heavily grazed down over two severe dry seasons cannot now carry a full beast to the acre throughout the year. The percentage of *Chloris* remaining in the third year ley is low, being only about 20% of the species present.

The *Chloris* ley on the west farm which has been used as a night paddock and strip grazed with an electric fence is now completing its third year. Under this system of utilisation, with a small amount of hand weeding, the *Chloris* content of the ley is very high, being about 90%. Production here does not seem to have fallen off despite being eaten right down during two dry seasons. The ley covers nearly ten acres and is night paddocked by a herd averaging 17 head throughout the year.

Experience of night paddocking this field has therefore been promising and the spread of manure brought about by the use of the electric fence promises bumper yields on subsequent cropping.

The considerable amount of work done on grazing experiments on this station in the past has now been collated and written up and will be published in due course. Most of this work has been concerned with the effect of the grazing animal on the fertility of the land. The effect on the animal itself is felt to be more in the province of the Veterinary Department.

The position at the moment is that certain areas on the farm have been set aside for future experiments, when the areas concerned have finished their cropping period. It has come to light during the course of the year that the most satisfactory technique for grazing experiments is one based on initial crop yields as a starting point for future measurements of the effect of various grazing systems on fertility trends.

The first grazing experiment to be started will commence in 1956. This will be designed to measure the effect on soil fertility of the system in which rough grazings are utilised during the daylight hours and cattle are then night paddocked on leys. The most usual system of cattle keeping in this country is one based on the utilisation of communal grazing areas during the day, the cattle then being kraaled in an open kraal during the night. Under this system, despite constant pressure being brought to bear on cattle owners by this department in the past, all the manure produced by these beasts is wasted. For many reasons the peasant economy does not seem able to support the labour and capital required for the proper production and utilisation of farmyard manure. We have found at Serere that night paddocking is comparatively simple in operation and of great benefit both to beast and land. It is intended therefore to try and measure the fertility trends of land subjected to day grazing and of land subjected to night paddocking. Past experience would lead us to believe that the loss of fertility one would expect on land which is grazed extensively for day grazing only is in fact slight whereas the fertility added to arable land by night paddocking may well be considerable because the areas are much smaller. Experimental proof is required, however.

Other experiments are still under consideration.

During the year about 100 acres of rough grazing land have been fenced and these paddocks enable the rough grazings to be utilised more efficiently. Also various management treatments, such as early and late cutting and burning, are being carried out, which together with controlled grazing will, it is hoped, yield some useful information on the optimum methods of utilising rough grazings.

(d) *Crop Agronomy*.—The standard rotation used on the farm, as in most areas of Teso District, is a six-course rotation with three years of cropping followed by three years under grass. The first crop is invariably cotton, planted in May or June. The second and third years then usually see two crops grown in each year, the spring crop planted with the first rains coming to harvest between June and August. Second rains crops are therefore usually planted from July until September. The number of crops suitable for planting in the second rains at Serere is strictly limited. In the past the pulses, cow peas and tepary beans have been used almost exclusively. Some sorghum and more recently sunflowers have also been planted. The records show that over eight years the average yields from cow peas is 250 lb./acre, and from tepary beans the average is 345 lb./acre over 12 years. Late sorghum has for many years now yielded very poorly. Sunflowers show promise of being a steadier yielder but more trials are necessary. Under peasant conditions of subsistence cultivation the pulse crops add protein and variety to the diet and, since their planting is universal in these areas, they are presumably worthwhile. However, on experiment farms such as Serere, where the costs of preparation, planting, seeding and harvesting are higher, it seems true to say that none of these autumn crops pays its way. Logically, it follows that they should be left out of the rotation altogether. If this was done, however, the amount of weed and grass growth that would occur between the harvesting of one spring crop and the planting of the next would make it expensive to prepare the ground once again for the second crop. The relative costs at Serere are as follows:—

(i) Complete costs of growing a cow pea crop, per acre ...	Shs. 73
(ii) Cost of extra cultivations for preparing the seed bed	
when no second crop is grown, per acre	Shs. 40
Difference in favour of (ii)	Shs. 33

In addition, the 250 lb. of cow peas obtained from (i) must be accounted for. At a normal price of 20 cents/lb. this would be worth Shs. 50 per acre, thus making (i) the most profitable practice on balance. In either case, however, it appears that money is lost on the operation and the deciding factor must be the yields of the subsequent spring crop. The question as to which treatment is best under our conditions must be answered. It would appear, however, that on farms of this nature the growing of a second cotton crop would be the most economic course in many years. The ratooning capabilities of sorghum should also not be overlooked, for, providing the pest difficulty can be overcome, this would provide a very cheap alternative.

A further point which is being investigated is the undersowing of crops to grass. The present practice of preparing a seed bed for sowing grasses is not

sound economically and only by undersowing the last crop in a rotation can a ley be held to pay its own way in comparison with natural regeneration.

LIVESTOCK

(a) *Cattle*.—The Serere herd numbered 299 head at the end of the year. 1954 has not been an exceptional year for animal production either of beef or milk, and the record for milk production remains as established during 1953 at 4,280 lb. of milk in a 305 day lactation. The dry season at the start of the year saw an ever-increasing daily milk yield until in March the average daily yield from the "milked out" herds reached a gallon (10·6 lb.) for the first time on record. However, with the rains this figure declined until during the month of July the average yield was only 6·7 lb. The average yield did not again rise until the dry weather set in in November. The annual average yield per head per day was 8·2 lb. compared with 8·7 lb. in 1953. Usually, as is to be expected, yields are higher during the rains and no definite reason can be given why this year results should be the opposite.

The most important factor affecting daily average milk yields is of course the number of calvings in the herd. The average figures for average daily milk production and numbers of cows calving down each month over past years fit fairly closely. The average calving figures for past years show higher calvings during the mid-months of the year, reaching a peak in November, and a corresponding rise in daily average milk production up to December. This year, however, the figures for calving do not fully explain the large peak in milk yields between the months of February and June. At all times of the year the Serere cattle have immediate access to unlimited water so that any drop of condition or milk production during the dry weather can only be attributed to inadequate nutrition. It would appear therefore that during the 1953–54 dry season there was adequate nutritious keep on the pastures although by the month of March all grass was in an exceedingly dry and fibrous condition. The fall in milk after the rains had set in is another problem. With the exceptionally heavy rainfall of April and May it can be hypothesised that the moisture content of the grass was so high that sufficient bulk could not be consumed to cater for the full nutritional requirements of a lactating cow. Also, cold wet nights with much insect annoyance are not ideal for animal health. However, the position here is complicated further by the fact that all milking cows at Serere are fed production rations for all milk produced. Furthermore, the results of feeding trials carried out during the year make the position more difficult to understand.

Briefly, six pairs of cows, very equally matched for past and present milk production, were entered into the trial on 1st June, while a further two pairs were introduced on 15th September. One beast in each pair received its normal production ration, while the other received no supplementary feeding at all. Of the first three pairs, when production was under one gallon per day, little difference in milk yields was observed for the remaining period of the lactation (Fig. V). The unfed beasts did however lose some weight as compared with the fed beasts. Of the second two pairs who entered the experiment in September the beasts receiving no supplementary feed definitely drew away from the fed beasts even at the 12 lb. per day level of milk production (Fig. VI). This trial

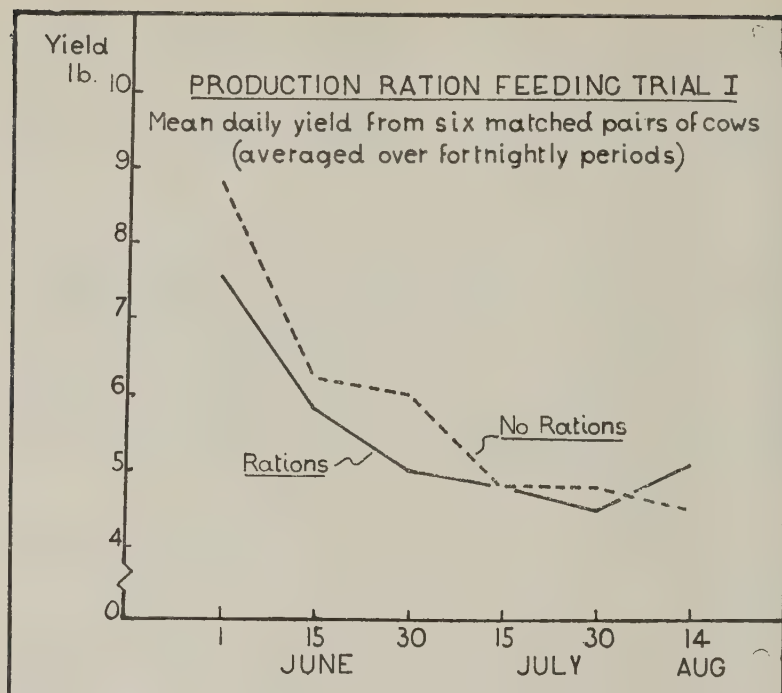


FIG. V

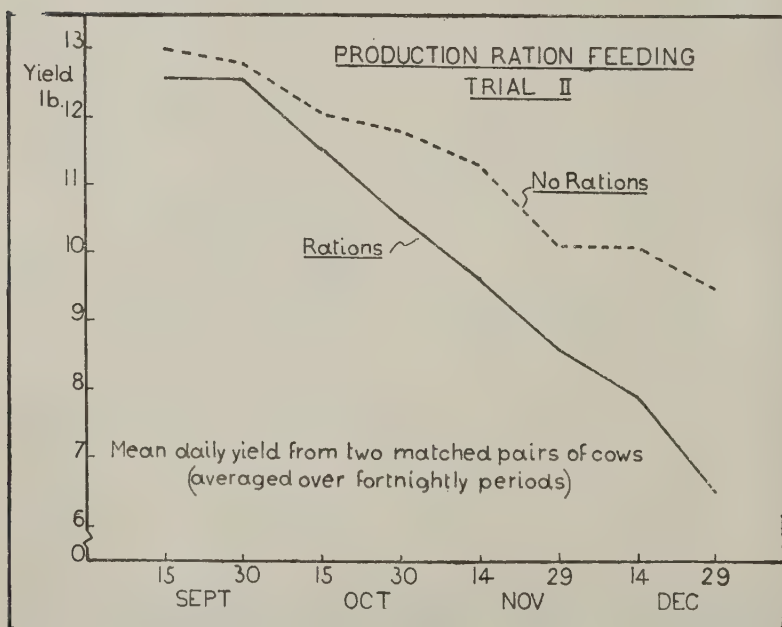


FIG. VI

is capable of analysis and will be written up in due course. Meanwhile we intend to continue investigations and observations of this intriguing problem.

The health of the herd has not been good during the year. The calf mortality rose to 12% and in addition to the deaths of 14 calves (all but one in the bucket fed group), six other beasts died from disease during the year. The majority of deaths can be attributed to blackquarter and all beasts are now regularly inoculated against the disease. However, the calf deaths are not fully diagnosed and the problem was in the hands of the Veterinary Department as the year closed.

The bull "MacDonald" (who was reported last year as having attained a weight of 470 lb. at the age of nine months) entered one of the breeding herds during November at the age of two years, his weight then being 701 lb. This is a noteworthy advance in early maturity and for the breeding programme when it is remembered that bulls at Serere in the past have not been put to service before four years of age. The bull "Watson" who is now four years of age is developing well and weighed just over 1,000 lb. at the end of the year.

"Odio", the bull who was purchased from a local cattleowner during 1953, is still by far the heaviest bull in the herd, having risen to nearly 1,200 lb. in weight during the year. At the end of the year he had produced five calves, all of which were heavier than any previously produced by their dams. His first calf, weighing 61 lb., was the heaviest calf ever produced at Serere, where the average weight at birth is 35 lb. The average weight at birth of the five calves from Odio is 48 lb.

The culling level in the two main "milked out" herds remains at 200 gallons. All heifers are entered into these herds for their first lactation at least. The semi-range herd continues to produce most satisfactory results and there is no doubt whatsoever that this is the system to be pressed upon local farmers. With once a day (morning) milking and the calves running with their dams during the daylight hours, cows are producing as much, and in some cases more, milk than they did when milked twice a day in the "milked out" herds, while feeding their calves as well. The conditions, and "bloom" on these calves is most satisfactory and they are a constant delight to observe.

The annual sales of cattle from Serere have been stopped as they were causing interference with the breeding programme. However, there are annually some exceedingly good young bulls available for sale by private treaty and during the year four such animals were sold to private persons in Uganda.

(b) *Pigs*.—The small herd of Wessex Saddlebacks x Large Blacks was maintained. Full recording was started in 1953 and recent litters have been quite promising, the last three numbering 10, 11 and 13 piglets. There is very little interest shown in pig keeping by local farmers, however.

(c) *Poultry*.—As a result of a severe culling programme and better feeding during the year, the station flock of Rhode Island Reds is now of vastly improved quality. However, it was decided during the year that we should not distribute home bred stock from Serere, but that we should receive regular consignments of day old chicks from the central breeding flock maintained by

the livestock improvement centre at Entebbe. These we should then rear and sell off as three-month-olds. The programme has been modified accordingly.

The new system of management is as follows:—

Chicks—0–8 Weeks—Reared in fold units and moved daily on short grass.

Growers 8–20 Weeks—Reared in aluminium night arks on free range.

Laying stock (station flock)—Permanent houses on semi-intensive system.

Young stock up to 12 weeks old are fed on imported (Kenya) mash, but from 12 weeks onwards all birds are fed on entirely home produced ration including blood meal and dried grass.

During the first half of the year hatching was carried out in a hot air incubator and hatching percentages were 46% under this system compared with 52% from sittings. The former figure is said to be not atypical of East African incubator hatchings where altitude may affect results.

Overall production of laying birds was 111.5 eggs per bird throughout the year. This is not a truly representative figure, however, as all ages of bird were included in the old flock.

The condition of recessive rumplessness reported on last year disappeared when rations were improved. Matings between rumpless birds produced all normal offspring when fed on a satisfactory plane of nutrition.

An outbreak of the “head lesion” type of fowl pox occurred in October. This may have been a result of exhibiting some birds at the Kaberamaido Agricultural Show early in the month. 40 cocks, 105 three month old chicks and 382 hatching eggs were sold during the year.

The demonstration flock of turkeys was maintained. These become a subject of lively interest as Christmas approaches every year.

EDUCATION SECTION

A total of 591 persons attended the various courses held at Serere during 1954. In addition, eleven Makerere students attending their first year's practical agriculture were in residence under the resident Makerere lecturer in agriculture.

The courses organised by the Serere staff include the apprentices' course (12 months) for training our own departmental assistant instructors, chiefs and cultivators' courses (1 week) for parties from all districts in the Eastern and Northern provinces, staff teachers' course (2 months), prison warders' courses (2 weeks), and various refresher courses. In addition, the annual chiefs' course was held at Serere during September under the control of an administrative officer. This year 12 wives attended. The agricultural subjects were taken by the Serere staff.

Extra courses on animal husbandry and one for assistant foresters were also fitted in during the year. Day visits included 25 chiefs and councillors from Bunyoro and a total of 183 schoolchildren.

During the year a site was selected for a farm institute at Arapai near Soroti. The education section will eventually move out from Serere to the farm institute.

The pupils were instrumental in sampling the soil for analysis by the Senior Chemist and in marking out a dam site for future water supplies.

MACHINERY (By D. J. Parsons and G. J. Webb)

At the beginning of the year the tractor strength at Serere consisted of:—

- 2 Ferguson petrol engined tractors.
- 1 Fordson Major kerosene engined tractor.
- 1 Caterpillar D.4 diesel tracklayer.

During the year a further Fordson Major diesel tractor was loaned to the farm by the Special Development Section. In addition, two Special Development Fordson Major tractors for contract work in the district were stationed at Serere.

Although rainfall in January was very low, 14 acres were disc-tilled and nine acres of *Eleusine* millet were drilled with the Albion force feed drill. In February there was a sharp increase in cultivation, over 100 acres being dealt with by disc-tiller, drill, Cambridge roll and spike tooth harrow. Most of this work was for the main *Eleusine* crop on the main farm. Ploughing commenced in March when 85 acres were recorded. Ploughing then continued until late September, the highest monthly figure reaching 112 acres during the month of May.

Mechanical planting of groundnuts was carried out for the first time at Serere. The implement used was a 2-unit 433 Massey Harris planter converted from a trailed to a mounted implement. Row width was set at 28", and at this spacing (to allow for efficient inter-row weeding) the stand must be very dense in the row. The acreage involved was rapidly planted with little trouble but the seed rate was not high enough although the machine was geared to its maximum seed rate.

The Albion force feed drill set at 14" again dealt with the *Eleusine* millet acreage. Although this implement is of great age, and is very worn, it accomplished its work with very little trouble. This drill was also used to plant the sunflower crop at 28", and, judging by final yields, the operation was successful.

Cotton planting commenced on 11th June. After the initial ploughing of new land five to six weeks previously, it was found that in some cases a rotovator mounted on the Fordson Major Voco tractor was able to bring the field down to a suitable tilth for planting in one operation. Where disc-tillers were used for seed bed preparation, two operations were necessary after initial ploughing.

For many years past the cotton crop at Serere has been planted with a Ransomes "Pilot" planter, a useful implement in its day but with no provision for planting at less than 20 to 25 lb. of seed per acre. The machine used this year was a 2-row Ferguson prototype planter. This machine was mounted on the three point linkage of the Ferguson tractor hydraulic lift, thus being at once superior to the "Pilot" which is a trailed implement originally designed for ox draught. An arrangement of gears allowed planting to take place at 12 lb. of seed to the acre. The whole cotton crop was planted with little trouble and

subsequent germination was very satisfactory. Being a prototype, however, the machine suffers from no spare parts being available.

The Massey Harris 6 ft. power take off "Clipper" combine was employed during the year as a stationary thresher for various crops such as sorghum, *Eleusine* millet, tepary beans, cow peas and sunflower. During July and August it became mobile and successfully combine harvested the standing *Eleusine* millet crop.

Harvesting commenced on 13th July on an area of 10 acres in field P55. The whole of this crop was standing very well at an average height of 3' 6", being well over 4' high in places. This was the heaviest crop we had to contend with during this season's harvest and yielded one ton of threshed seed per acre. Progress was slow, opening up the strips being very difficult owing to the high moisture content of the stems. Harvesting this field was not completed until 21st July, weather being most unfavourable during the whole period. Morning dews were heavy and thick cloud persisted until late afternoon, three complete days being lost due to rain. At no time was the machine able to commence operations earlier than 2 p.m. and the longest working day was four hours.

A further 15 acres were commenced on 29th July. This crop was not so heavy as the crop on P55 but in places was very dense due to weed growth in a wet season. By this time weather had improved slightly and operations were able to commence at 11-30 a.m. Stoppages included, the machine was turning out just over 1,000 lb. of threshed seed per hour. After further delays caused by rain harvesting was completed on 5th August after only six days of actual work during this 15-day period.

The remaining 10 acres of *Eleusine* on Block IX was harvested in 1½ days commencing on 6th August. This was the most successful day of the year, yielding 62 bags amounting to 8,104 lb. of grain.

In the light of two years experience with the "Clipper" combine harvesting *Eleusine* millet, the following observations can be made: —

All combine operations, especially the opening up of fields, would be greatly improved if the machine had its own engine. The combine would not then have to rely on the power take-off speed of the tractor and tractor speeds could be cut down to a minimum when operating in thick crops.

The most efficient drum speed is 1,200 r.p.m. The fan shutters need to be almost closed and the concave set at $\frac{1}{8}$ " to $\frac{1}{16}$ ". The chaffer sieve is best set half open. The fixed screen is a $\frac{3}{16}$ " round hole. Power take-off speed is 560 r.p.m. unloaded and 530 r.p.m. loaded. The scour cleaner cylinder screen should be cleaned out every two hours when working, a $\frac{3}{32}$ " round hole screen being used. Wind deflectors are used in the half-way position.

Generally in a heavy crop, loss cannot be avoided owing to the small size of the *Eleusine* seed. Every small aperture and crevice throws out seed and a certain amount is thrown over the back shaker shoe. The percentage of broken grain this year was very small and the sample was excellent.

A further five acres of *Eleusine* was planted as a trial during late August using a series of bean seeder units mounted on a Ferguson tool-bar. Although the seed rate was high, this can be adjusted, and the standard of work of these units on a fine seed bed was high. This crop was eventually combine harvested very successfully under ideal conditions in December.

The combine was used again in October to try and harvest *Chloris* seed on the new grazing area. This operation was not successful mainly due to the uneven state of the ground. Valuable experience was gained, however, and under the right conditions it is now felt that the combine should be able to handle this crop in future. While working near the farm perimeter a great deal of interest was shown in this weird and wonderful machine by local farmers and a certain amount of time was spent in trying to explain how it all worked.

Some of the ploughing and most of the weeding carried out during the year was performed by ox drawn implements. We now have some years' experience of ox implements, ranging from ploughs, through a small range of disc-tillers and weeders to harrows, ridgers, carts and mowers. Many of these implements do a splendid job of work and are very cheap in operation. This being so, we feel that there is a future for them in the districts and during 1955 an effort will be made through district staff to get people interested in their use.

Other mechanical and ox operations on the station include over 1,000 hours of transport and many hours of grass cutting. On this latter operation much money has been saved during the year by the purchase of a second ox mower.

The clearing of the Main Farm continued slowly during the year. The D.4 is now very old and spent far more time in the workshop than in the field. By the end of the year this tractor with the help of a hand-operated monkey-winch had nearly cleared two blocks on the east farm, and all the central farm area.

The two Ferguson tractors, together, worked for 2,014 hours during the year and the Fordson Voco recorded some 582 hours.

SPECIAL DEVELOPMENT UNIT

The small unit of two Fordson Major Voco tractors maintained and operated from Serere are reported on elsewhere. Contract work in Teso District, never very large, is slowly declining. The main reason for lack of orders seems to be the increased rates now charged. However, the type of agriculture practised and social systems in this district do not lead one to expect great scope for contract tractor work here.

VISITORS

145 visitors signed the visitors book during the year. Many other day visitors are not included in this total.

VIII. Annual Report—Section of Botany and Pathology

By J. D. JAMESON, O.B.E., *Assistant Director of Agriculture (Research)*

CEREAL BREEDING

Maize breeding is closely co-ordinated throughout East Africa under the E.A. Agriculture and Forestry Research Organisation Specialist Committee on Agricultural Botany. The agreed programme is:—

(a) to breed efficient self-propagating varieties for African cultivation in the different maize-growing areas;

(b) to incorporate in these varieties the gene for resistance to *polysora* rust which has been recently identified by Dr. H. H. Storey at E.A.A.F.R.O. headquarters.

The maize crop in Uganda is founded mainly on war-time importations of seed from the Kenya highlands. Its principal constituents are the varieties *Njoro Hybrid* and *Muratha* from Kenya, *Nalwangu* (K8) from Mubende in Uganda, and a residue of older seed which has been in Uganda for many years.

By applying Lonnquist's method to *Muratha*, a first synthetic variety has been produced which is expected to mature a week earlier and to yield 20% more than the parent stock. The gene for resistance to *polysora* rust is now being transferred to this improved strain.

The records of past work on sorghum and finger millet at Serere have been carefully summarised. The completion of this task is timely in view of the proposal to co-ordinate work on sorghum throughout East Africa with headquarters at Ukiriguru in Tanganyika.

Dr. G. Watts-Padwick visited Uganda in June 1954 at the invitation of Government to report on the prospects of rice cultivation. An important botanical contribution was his finding that the variety *Bungalla* exhibited strong resistance to Blast disease.

COFFEE VARIETIES

Variety trials of Robusta coffee at Bukalasa and Kawanda, from which records of six to nine years cropping are available, have shown substantial differences between varieties. The yields are expressed in cwt. of clean coffee per acre per annum.

These trials were conducted on different sites and no comparison of yield between groups is possible. However, it is fairly clear from other evidence that the *Nganda* or spreading type is best suited to backyard cultivation, and that the erect type is a better proposition for any regularly spaced plantation.

Maitland's Erect		Liebenberg's Erect		Thomas's Nganda	
Variety	Yield	Variety	Yield	Variety	Yield
3/71	8·1	288a. 3F	16·5	203/30	6·1
3/20	7·4	286. 1D	14·5	223/32	5·6
2/13	6·7	36. 3A	13·4	236/26	5·4
1/15	6·7	80. 3F	13·1	259S/56	5·4
1/2	5·9	290c. 2B	12·9	258S/24	5·4
		300b. IE	12·5	257S/9	5·3
		73. 4C	12·2	257S/53	5·2
		228/8. B	10·2	234/25	4·6
				213/35	4·3
				257S/12	4·0

A series of variety trials of Arabica coffee has now been established in Bugisu District. These trials comprise the leading varieties from Kenya and Tanganyika, the seed of which has been kindly supplied by the research stations at Jacaranda and Lyamungu.

COTTON VARIETIES

The variety S47 is now in general cultivation throughout the Eastern and Northern provinces, and has raised yields by about 30%. The lint of this variety, when first distributed, was prone to seed coat neps. This objectionable character is associated with the roller ginning of a very fuzzy seed, and is believed on good empirical evidence (though not named at the time) to have been a feature in the early history of the variety N17. The fuzziness of seed diminishes in general cultivation, because very fuzzy seeds germinate less readily and are more liable to be crushed in the gins. It was therefore predicted that the seed coat nep trouble would right itself with time, and figures kindly supplied by Mr. J. P. Evenson of the Empire Cotton Growing Corporation show that this prediction is being realised:—

1951–52 48% of seeds damaged.

1952–53 34% of seeds damaged.

1953–54 25% of seeds damaged.

A figure of 20% or less is normal, and causes no complaint.

Breeding for Buganda and the Western Province is in the hands of the Empire Cotton Growing Corporation, and the improved strain BP52/NC54 was released for multiplication on Government farms.

MAIZE RUST (*Puccinia polysora* Underw.)

This new rust, which reached East Africa in 1952, has not proved serious on the relatively cool and dry plateau of Uganda. Nevertheless we have contributed our share to the East African programme.

Trials conducted at Kawanda (and elsewhere in East Africa) have confirmed that the results obtained by Dr. Storey from juvenile resistance tests at E.A.A.F.R.O. headquarters are applicable in the field. As mentioned under cereal breeding, the resistance gene which he has identified is being transferred to local material at Kawanda. Furthermore, circumstances at Kawanda have revealed that the exotic material from which this gene was obtained differs widely

in its reaction to Streak disease. It may therefore prove to be a source of resistance to Streak, and this knowledge has been made available to other workers in East Africa.

BLAST DISEASE OF RICE

A small collection of rice varieties was assembled at Kawanda. The swamp proved to be highly unsuitable for rice cultivation, but as a consequence was an ideal site for selecting varieties resistant to Blast. The wild grass *Panicum adenophorum*, which is a probable source of infection, is present in abundance. The finger millet crop in the Eastern and Northern provinces, which suffers from the same or a closely related disease, was heavily attacked in 1954.

SWEET POTATO

Study of the virus complex has been undertaken at E.A.A.F.R.O. headquarters, and two papers have been published:—

SHEFFIELD, F. M. L. (1953), *Empire J. Expt. Agric.*, 21, 184.

SHEFFIELD, F. M. L. (1954), *Empire J. Expt. Agric.*, 22, 97.

The latter attributes the "woolly" condition to the activities of a mite, and so disposes of one complication.

IRISH POTATO

The Commonwealth potato collection from Cambridge has been kept under routine observation, but close study has not been possible.

BANANA WILT (*Panama Disease*)

No new centre of infection has been reported during the year, and there has been much to suggest that the effect of banana wilt in Uganda is not nearly as serious as it is amongst the sweet bananas of the West Indies.

A carefully controlled experiment comprising sixty varieties has been planted at Kawanda for the purpose of identifying immunity or resistance to the disease. Information is also exchanged with the Plant Pathologist in Tanganyika.

STEM-PITTING OF CITRUS

It has long been suspected that the quick decline virus complex was widely distributed in citrus in Uganda, as in South Africa and elsewhere. In April 1954 a positive diagnosis of the stem-pitting symptom was made at Kawanda by Dr. E. A. Riley, Plant Pathologist in Northern Rhodesia.

Information has been assembled by the Botanist at Serere, who will now be in a position to make a more realistic approach to the problems which arise in propagation work when this virus is present. The same considerations apply at Entebbe, which is the other propagation centre. Briefly, there is no serious disturbance to the cultivation of oranges and lemons, but other species, and limes in particular, will present difficulties.

SUNFLOWER

A condition resembling the Argentine virus disease was noticed at a number of places, and was duly reported to the Commonwealth Mycological Institute.

It did not assume serious proportions, but it is said to be seed borne in the Argentine, and the export of seed for planting purposes had to be suspended.

COFFEE DISEASES

Despite our inability to detail adequate staff to the study of coffee diseases, some progress was made in the assessment of the problems.

Spraying Arabica coffee at Kawanda (3,900 feet above sea level) with 0.3% Perenox at monthly intervals improved the health of the trees and increased yield. Satisfactory control of leaf rust (*Hemileia vastatrix*) was achieved, but in view of experience in other countries this is not likely to account for the whole effect.

Useful records of disease and mineral imbalance were also made on Robusta coffee.

CONTROL OF BACTERIAL BLIGHT (*Blackarm*) IN COTTON

Cotton seed for planting was dressed in Teso, Mbale and Mengo districts, using the copper dressing *Perecot* 45 (Messrs. Plant Protection Limited) in horizontal drum mixers (Messrs. J. Booth & Sons). Annual surveys have shown a progressive reduction in the proportion of the cotton plant population showing lesions of bacterial blight on the main stem, which is an early critical phase in the development of the disease. The 1954 survey revealed these figures:—

Busoga and Lango not dressed	53%
North Mbale dressed for two seasons	14%
South Mbale dressed for three seasons	10%
North Teso dressed for four seasons	7%
Segregated Area dressed for five seasons	4%

and in Mengo District:—

Ssingu County not dressed	65%
Bulemezi County dressed for one season	11%

Calculations based on district yields cannot be precise, but the benefit to yield in Teso and Mbale has been substantial, and has added to the improvements resulting from better cultivation and the introduction of the new variety S47.

The recurrent cost of seed dressing and distribution is only about Shs. 1/50 per acre. Moreover it has been found that less seed has been issued for planting in areas where the seed has been dressed, and the value of this saving off-sets the whole cost of dressing.

RATOON STUNTING DISEASE OF SUGAR

This virus disease was recognised ten years ago in Australia and is probably widely distributed. It was diagnosed at Kawanda in December 1953 by Dr. H. Evans (of Messrs. Booker Brothers, McConnell & Company) and the commercial estates are heavily infected with it.

Within the next few months 23 varieties from different parts of East Africa were assembled at Kawanda and some 1,500 planting sets were subjected to heat

treatment. Immersion for one and a half hours in a water bath at 52°C is an effective cure for the disease, but as the disease is transmissible by knives the subsequent propagation must be done with great care and attention.

The annual loss to Uganda from this disease is estimated at 15,000 tons of prepared sugar, but this can be overcome if the systematic replacement of infected canes is successfully organised.

Field trials have been planted to estimate losses more precisely, to check that treatment has been successful, and if possible to extend our knowledge of the symptoms. Until very recently certain diagnosis was extremely difficult, and no external symptoms have been described even now. Nevertheless, there was much debate about the appearance of the sugar at Kawanda in 1953, and a visit from Dr. Evans, who had first-hand experience of the disease, was a singularly fortunate chance.

IX. Annual Report—Section of Chemistry

By E. M. CHENERY, *Senior Chemist*

GENERAL REVIEW

Despite the fact that one or another of the senior staff of this section was away from the Protectorate for considerable lengths of time during 1954, very good progress was made in all lines of investigation. Notable advances have been made in our knowledge of the soils of Uganda in respect of their fertility and productivity, together with their distribution, morphology and genesis. It is felt that, within the next two or three years, the distribution of the major soil types will be sufficiently well defined to enable an accurate small scale soil map to be drawn. Also, the agronomic aspects of these major soil types, such as cropping cycles and fertiliser practice for maximum production, will be so clear-cut that recommendations could then be made to farmers with a high degree of confidence.

An excellent start was made during the year in publishing some of the backlog of work of this section. The first four of the following papers which were presented at the Leopoldville soil conferences, are now in the press and the last two have already been printed.

1. A Review of Recent Trials with Fertilisers in Uganda, W. R. MILLS, *Comptes Rend. Con. Int. Afric. Sols*, 1954.
2. A Fertiliser Trial with *Chloris gayana* and the Yield of a Subsequent Cotton Crop. W. R. MILLS, *ibid.*
3. Minor Elements in Uganda Soils, E. M. CHENERY, *ibid.*
4. Acid Sulphate Soils in Central Africa, E. M. CHENERY, *Trans Vth Int. Congress Soil Sci.*, 1954.
5. A Preliminary Study of Aluminium and the Tea Bush, E. M. CHENERY, *Plant and Soil*, VI, 55, 1955.
6. The Transient Effects of Grasses on the Structure of Tropical Soils, H. C. PEREIRA, E. M. CHENERY and W. R. MILLS, *Emp. J. Expt. Agric.* 22, 148, 1954.

SOIL FERTILITY AND PRODUCTIVITY

Long-term Fertiliser Trials

The Chloris Fertiliser Trial at Serere.—Full descriptions of this and most of the other experiments reported here have been published elsewhere (1, 2). Two more indicator crops have been obtained in this trial, of which the mean responses are tabulated below:—

TABLE I
MEAN OVERALL PERCENTAGE INCREASES

	L	FYM	N	P	K	Control Yield
<i>Chloris</i> Fertilised	2.8	20.0	18.2	17.3	6.3	18,995
Cotton 1st Indicator	0.5	14.2	0.3	8.3	1.6	760
Finger Millet 2nd Indicator ..	12.6	1.7	17.3	18.1	8.2	2,060
Cow Peas 3rd Indicator	34.7	14.3	-10.5	13.8	-2.7	82
Mean Residual Increase	15.9	10.1	2.4	13.4	2.4	

The residual effects of lime, farmyard manure and superphosphate are clearly demonstrated. The 35% increase of cow peas due to lime applied nearly three years previously is noteworthy; the best combinations were lime plus farmyard manure and lime plus phosphate which gave 53% and 29% increases on the cow pea crop. The figures in the control yield column are the yields in lb./acre of the single untreated plot only. The percentage overall responses relate to the 16 plots with and the 16 plots without the treatment indicated.

Rock, Soda and Superphosphates Trial at Kawanda.—Maize, the seventh successive crop to be grown in this experiment since it began, showed slightly superior benefits from the rock phosphate treatment. The overall increase on a mean yield of 1,772 lb. grain per acre was 17% for the double (30 cwt./acre) dressing of rock phosphate; for the combined single and double dressings the mean increases were 8%, 3% and 9% for rock, soda and superphosphates respectively. The nitrogen dressings of two and four cwt. per acre of sulphate of ammonia gave overall increases on a yield of 1,658 lb. grain per acre of 15% and 20% respectively, neither of which would be profitable. Dry weather after tasselling was responsible for these moderate yields after an early promise of a record crop.

Rock, Soda and Superphosphates Trial at Buwunga, Masaka. The Cotton Crop.—Single superphosphate gave an average of 92% increase on a 433 lb./acre crop of cotton with both dressings (15 cwt. and 30 cwt./acre) applied four years previously. The best treatment was superphosphate at the lower rate, which gave 108% increase on a 433 lb. crop. The overall effects were increases of 15%, 34% and 101% respectively for rock, soda and superphosphates. The mean phosphate effects for all treatments were 52% and 48% benefits from the single and double dressings respectively. Nitrogen as sulphate of ammonia at 2 cwt./acre applied to this crop at planting produced an overall increase of 23%, but at double this rate the response was a decrease of 7%. No crop at all was given by the plots without mulch due to cricket damage.

The Sorghum Crop.—The best treatment, which it must be remembered was residual after six crops, over the previous four years was 25% increase on a 1,431 lb./acre grain yield, from the double dressing of superphosphate. The overall effects were 13%, 12% and 20% increases from rock, soda and superphosphates respectively. The residual effect of nitrogen applied to the previous cotton crop was 15% from the lower dressing and 12% from the higher. This result is particularly interesting in that it suggests a sulphur deficiency in view

of the fact that nitrate of soda in previous crops produced no residual effects. The overall phosphate responses were increases of 7% and 18% for the single and double dressings respectively. As usual, in this experiment the split plots which were mulched were spectacularly better than the unmulched plots, the increase being 187%.

Time of Application of Nitrogen Trial at Kawanda.—The results of this experiment are extremely satisfactory in that they show promise of highly profitable returns from cotton grown on old land, even in an exceptionally dry year. With the third early cotton crop since the land was opened up and dustings of D.D.T. for *Lygus* control, 1 cwt./acre of sulphate of ammonia, applied at planting, increased a control yield of 594 lb./acre seed cotton by 18%; applied at budding (squaring) by 26% and at flowering by 8%. In the presence of a light basal dressing of triple superphosphate ($\frac{1}{2}$ cwt./acre) and sulphate of potash (48 lb./acre) placed, the same control yield with the same sulphate of ammonia dressings was increased by 32%, 39%, and 41% respectively. The overall contribution of the basal fertilisers was a 20% increase. Nitrogen applied at squaring would be highly profitable as an investment of Shs. 40 in a hundred-weight of sulphate of ammonia would bring the grower a return of Shs. 90 in six months from land in its third year of cultivation.

SHORT-TERM FERTILISER TRIALS

Nitrogen and Phosphate Trials. The Cotton Crop.—From each of nine trials, three crops were reaped in 1954. Fertilisers were applied to each crop in a factorial combination of broadcast or placed phosphate (1 cwt./acre triple superphosphate) with and without placed sulphate of ammonia (2 cwt./acre). The fertilisers only benefited the cotton on the sandy soils of eastern and northern Uganda. Thus, the poorest soil at Katakwi showed the largest effect with placed phosphate producing yield increases of 117% and nitrogen alone 76%. At Ngeta, an improvement of 23% was obtained from placed phosphate, both with and without additional nitrogen. Nitrogen alone and broadcast phosphate alone had little effect, but together they increased yields by 20%. Yields at Serere were depressed by phosphate, but in the nearby *Chloris* experiment a residual effect of 8% increase was obtained from phosphate applied previously to the grass ley. At Bulopa, significant increases were produced by broadcast phosphate but not from placed phosphate. The trials on heavier, red latosolic soils gave only small and variable responses.

The Finger Millet (Eleusine) Crop.—The finger millet crop which followed cotton on all sites showed the same pattern of results. The poor sandy soils of Katakwi gave 61% and 60% overall increases on a mean control yield of 1,433 lb./acre, and 57% increase on a mean control yield of 1,567 lb./acre for broadcast phosphate, placed phosphate and nitrogen respectively. In the trial at Serere head increases of 30%, 11% and 23% were given by these respective treatments, and at Bulopa, as the result of a wet growing season, nitrogen increased a mean grain yield of 1,527 lb./acre by 35%. At Ngeta overall increases of 22% and 28% on a 2,739 lb./acre crop were obtained from placed and broadcast phosphates respectively and also a 27% increase on a 2,819 lb./acre crop from nitrogen. Responses on the red soils of southern districts were small for

both broadcast phosphate (6%) and placed phosphate (1%) and negative (-1.5%) for nitrogen. It would seem that phosphate and nitrogen placed near the finger millet seed is definitely harmful.

The Bean or Cow Pea Crop.—The pulses crop gave, on the whole, more consistent results throughout. For seven trials nitrogen induced an average reduction of 7% (probably due to increasing soil acidity); the only positive results were a 16% increase at Namyoya and an 8% increase at Ngeta. The sandy northern soils again showed responses to both placed and broadcast phosphates the 153 lb./acre cow pea crop at Katakwi being increased by 60% and 74% respectively and the 461 lb./acre Ngeta crop by 9% and 21% respectively. At Serere, the increases were 26% and 37% on only a 345 lb./acre yield of cow peas from broadcast and placed phosphates and, at Bulopa, they were 37% and 57% respectively from beans (control yield 317 lb./acre). On the southern red soils the only outstanding increases were 17% on an 895 lb./acre mean control yield of beans from placed phosphate at Nakabango and 23% on a 458 lb./acre bean yield from the same treatment at Namyoya.

Nitrogen and Mulch Trials. The Cotton Crop.—These trials were laid down near five of the above N-P trials, on land newly opened from grass. The treatments were a factorial combination of grass mulch with 2 cwt./acre of broadcast sulphate of ammonia, all being applied at planting. The first crop was cotton which showed consistent increases from mulch, the largest being 42% and 32% on the light soils at Ngeta and Serere respectively; the heavy red soils only averaged 12% increases. The overall nitrogen effect was not significant due to the fact that the land was newly opened from fallow.

The Finger Millet Crop.—Finger millet followed the cotton at all centres except Serere where the seed was washed out of the ground. The mulch treatments adversely affected germination and early growth in all trials and this was reflected in the final yields. Reductions averaged 17% for Ngeta, Nakabango and Bukalasa with all treatments, but at Kawanda, where the rainfall was exceptionally low, benefits were considerable, an 89% increase being obtained with mulch alone and 118% increase with the combined mulch-nitrogen treatment. Nitrogen alone gave a consistent negative response (mean 14%) at Kawanda, Bukalasa and Nakabango and an increase of 17% at Ngeta.

The Bean Crop.—Beans followed finger millet on all plots (except at Ngeta where cow peas were planted) in this series. Mulch responses were consistently positive, the average (excluding Ngeta) being 24% and the best 43% at Nakabango. Additional nitrogen increased the mulch effect at Kawanda to 38% but reduced it at Nakabango to 32% and at Bukalasa from 13% to 9%. Overall increases of 27% from nitrogen and 37% from mulch were obtained at Ngeta with cow peas.

The Kawanda Classic Nitrate Experiment.—Regular observations of soil nitrate fluctuations were discontinued in April 1953 and the shade taken down. All plots then received a basal dressing of 3 cwt./acre each of triple superphosphate and sulphate of ammonia and the former bare plots were still left bare until early 1954 when all plots were planted with maize. The original treatments showed up as follows: —

On a control yield of 1,831 lb. grain per acre, lime increased yields by 25%, mulch by 62%, nitrate of soda by 9%, farmyard manure by 24% but sulphate of ammonia reduced yields by 10%. The overall yields from plots that had been previously cropped, kept bare and open or bare and shaded, for the previous three years were practically identical. Any losses of plant nutrients by the three years of cropping were thus more than made up by the basal fertiliser.

Soil Structure Experiment at Kawanda.—A paper describing the transient effects of the grass ley on maintaining soil structure has been published elsewhere (6). The main point brought out in this paper was that the rate of deterioration of soil structure during the arable break is as important as its rate of restoration under grass. The physical benefits of the grass treatments were constantly better than the cover and annual crops. But subsequent yields of indicator crops showed that cover crops and not grasses were the best resting treatment.

This brings to the fore the question of differences in the build-up of plant nutrients in the three years of the resting treatments. The experiment was not originally designed to test this effect and all tops and woody roots of resting treatments were removed from the plots before the indicator crops were planted. The influence on nutrient status of fine root residues and a little leaf fall is all that can be measured by analysis of the soil. In spite of this composite top-soil, samples (0-6, 6-12 inches) were taken from each of the 60 plots and analysed by routine methods. The mean results tabulated below demonstrate that the contribution of major nutrients, particularly phosphate, to the overall benefits of the resting treatments is probably more important than that of physical amelioration of the soil. If all the minerals contained in the tops of resting treatments had been returned to the soil the results would have been even more striking.

TABLE II

INFLUENCE OF RESTING TREATMENTS ON SUBSEQUENT CROPS AND SOIL.
CHEMICAL AND PHYSICAL PROPERTIES

Previous Cover		Grasses	Cover Crops	Annuals
Four Indicator Crops	..	100	105.5	70.4
Two Cotton Crops	..	100	102.6	72.1
Phosphate	..	100	106.1	66.7
Potash	..	100	81.5	64.8
Nitrogen	..	100	106.5	96.8
Structure	..	100	97.3	90.7
Pore Space (1330 cm.)	..	100	109.2	102.0
Infiltration Rate	..	100	91.3	82.9
Percolation Rate	..	100	77.6	64.6

NOTE.—The Indicator crops were maize, cotton, soya, cotton, maize. In the table the yields of the first maize crop are omitted as they were unduly influenced by extreme nitrate deficiency in the plots previously under Paspalum and nitrate abundance in the previous *Leucaena* plots. As in the published paper (6) only three blocks (36 plots) have been included.

Minor Elements.—A general survey of the present position with regard to minor elements in Uganda has been published elsewhere (3). Additional information has since been obtained by means of the Webb-Hewitt pot culture technique. This consists of watering seedlings growing in small pots of the soil under examination with nutrient solutions containing all major and minor elements, with one element missing in each treatment. In this way, the effect of depriving a fairly vigorously growing seedling of an element which may or may not be supplied by the soil is probably exaggerated, but deficiencies are revealed in three to four weeks. The first soil to be tested was taken from block I of the long-term structure experiment which is now so run-down that cotton will only grow a few inches. Differences began to show within two weeks, and after five weeks the tomato test plants were pulled up, dried and weighed; phosphate (7%) proved the most serious deficiency, then nitrogen (31%), then sulphur plus magnesium (38%), then manganese (58%), then molybdenum (62%), then potash (69%), then calcium (71%), then iron (81%), then boron (99%); zinc and copper proved to be adequate or in excess as they gave yields of 101 and 110% respectively, doubtless due to contamination from a brass sieve. The percentages in brackets are the weights of tomato tops expressed as a percentage of the yield from pots receiving the complete nutrient solution. The poverty of the soil was such that by itself (i.e., treated with distilled water) it only produced 4% of the control yield. The above type of experiment is so easily and quickly carried out that it will be introduced as a routine test for all problem soils and sites for proposed fertiliser trials. A factorial pot experiment will be designed to study the interactions of the various deficient minor elements so that the correct combinations can be applied in the field.

SOIL DISTRIBUTION, MORPHOLOGY AND GENESIS

Soil Survey.—A detailed survey was made of the soil of an area in north Ankole selected as a possible site for a new sugar estate. Forty-one test pits were sampled and, apart from a small corner, the soil, on analysis, proved eminently suitable for sugar-cane, provided it could be irrigated. It was particularly rich in all the major plant nutrients and had a very good physical structure and internal drainage. It is unfortunate that such potentially highly productive land should remain undeveloped as its irrigation would apparently present no technical difficulties.

In connection with the swamp utilisation and water resources surveys conducted by a well-known firm of civil engineers, about 1,000 samples were tested during the year. It was revealed that in Kigezi most of the swamps could be drained without fear of becoming sterile. The Semliki River area of Lake Albert flood plain proved to be quite unsuitable for agricultural development owing to a high content of sodium in the soil.

The soil survey of Busoga District was continued by the Forest Officer for whom 147 samples were analysed. In collaboration with this officer, a study of the effect of the mvule tree on soils was completed. It was found that the presence of alkalinity in the soil near the trunks of the trees was a constant feature that could be attributed to a variety of causes, such as leaf fall, accumulation of

grass residues, honeydew and rainwater washing out lime from concretions embedded in the trunk.

Three *ad hoc* surveys were made in connection with the new coffee research station in Kyagwe, a farm institute in Teso and Bakiga resettlement areas in Ankole. Much soil information was collected during the ecological survey of the southern part of the Lake Kioga basin. All the above soil data will eventually be incorporated in a soil map of the Protectorate.

Pedology.—During the year a record number of about 3,000 samples were examined in the laboratory and 368 new soil profiles described in the field. Some of these are of general pedological interest as little or no scientific information exists about them. They are:—

(a) the dark horizon latosols of Kigezi which have a black layer of humose soil sandwiched between reddish stony material;

(b) true podsollic soils found in quartz gravel at the highest elevations in western Ankole;

(c) heavy, very acid clays of Mount Elgon coffee land which are abundantly rich in bases compared with the rest of Uganda, indicating the presence of a montmorillonitic clay mineral;

(d) base deficient soils of the northern islands and littoral of Lake Victoria having an extremely high available phosphate content which might be ascribed to bird dropping and dead lake flies.

A pedological study was made by a spectro-chemist at Rothamsted Experimental Station of the distribution of minor elements in certain Uganda soils. These soils were found to be comparatively rich in chromium, vanadium, cobalt, copper and zinc, average in gallium, nickel, zirconium, barium and rubidium and poor in tin, lithium, yttrium and lead. Cobalt contents of a Kigezi soil were notably very low and this may be tentatively correlated with unthriftiness and infertility of cattle. The widespread abundance of copper and zinc may explain why no responses to these elements have yet been obtained when they were applied to crops. Molybdenum appears to be concentrated in murrum or sheet ironstone and may be thus unavailable to plants (*vide* page 112). Volcanic soils were particularly rich in strontium and barium; the former element will thus be a useful routine indicator of volcanic soils as it is very simply determined.

X. Annual Report—Section of Entomology

By A. P. G. MICHELMORE, Senior Entomologist

STAFF

The Senior Entomologist was based on Kawanda for the whole year. The Entomologist was stationed at Kawanda, went on leave at the end of June and subsequently resigned. A second Entomologist arrived at Kawanda on first appointment in June, and was posted to Serere in September. The Colonial Insecticide Research Field Officer, who has been seconded to the section for several years, transferred to a contract appointment with the department at the beginning of the year as Insecticide Mechanic stationed at Serere but was absent for three months on vacation leave. The Assistant Agricultural Officer was stationed at Serere until December, when he was transferred to Kawanda. The junior staff comprised fifteen Africans based on Kawanda and Serere.

SUMMARY OF WORK

The duties of the Entomological Section combine extension and research work. The first Entomologist finished and wrote up his work on root-knot eel-worm of tobacco. The Research Mechanic was engaged on workshop and field trials of insecticidal machinery in collaboration with the Assistant Agricultural Officer, who was responsible for the entomological and agronomic aspects of the trials of insecticidal control of cotton and coffee pests. The latter officer spent the rest of his time working on cereal pests. Research on cereals was taken over in September by the second Entomologist, who had previously spent three months becoming familiar with the country and its pest problems. The Senior Entomologist dealt with the remaining work, which included plant quarantine, teaching, public relations, stored products, locusts, pests of cotton, coffee and other crops, and routine work on collections and records.

COLLABORATION

A full course in agricultural entomology was given by the Senior Entomologist to the second year agricultural students at Makerere College, who showed some improvement over those of recent years.

Amongst official visits, the most prolonged and fruitful ones were the following: Dr. R. A. E. Galley, Director of the Colonial Products Laboratory, on collaboration in insecticidal research and grading of produce; Mr. C. A. Jones, Chemist, Colonial Agricultural Insecticides Research Unit, on collaboration with that unit; Mrs. R. G. Tapley, Entomologist, Lyamungu, on Robusta coffee pests; Mrs. C. Blair, lecturer in the Ministry of Agriculture and Fisheries, Pest Infestation Division, on stored products pests. The marketing of insecticides and insecticidal machinery was discussed with various commercial visitors, as a result of which there are signs of the present poor supplies improving to some extent.

The Tanganyika Government is helping Uganda with trials of storing damp maize in pits. The Senior Entomologist examined the pits at Morogoro in June.

The Senior Entomologist attended a Conference on the Medical, Agricultural and Veterinary Aspects of Food Production and Utilisation in East Africa, held at Kampala in March. He read a paper on "food storage problems in Uganda in relation to insect pests", a subject on which more propaganda is badly needed.

In the latter part of the year the Senior Entomologist collaborated with the Kampala Produce Exchange in an attempt to establish criteria for grades for agricultural produce. This work is important entomologically from two angles, firstly because many defects in stored produce are due to insects damaging it before or after harvest, and, secondly, because a fixed price for a single bulk F.A.Q. grade gives no incentive to growers or merchants to produce a better crop, whether by control of pests or by any other means. Furthermore, the lack of really first-class produce runs Uganda into the risk of losing her export markets, when world supplies catch up again with demands. This work is continuing.

The Research Mechanic visited the Colonial Insecticide Committee and research workers and makers of insecticide machinery in England.

In 1953 an Entomologist from the Belgian Congo had visited Uganda to see and discuss insecticidal control of *Lygus* and other pests of cotton. In May 1954 the Senior Entomologist paid a most valuable return visit to the eastern and southern Congo. The bolder insecticidal policy there seemed to be justified by the more serious attacks by pests, by the more abrupt ending of the rains, which makes recovery of the plants from attack less frequent than in Uganda, and by the greater control exercised by Government over native cultivation. The Uganda policy of steady but cautious expansion was therefore confirmed.

The Senior Entomologist acted as Secretary of the East African Agricultural Specialist Entomological and Insecticides Committee and of its Insecticides Sub-Committee. The former met in Tanganyika in May and the latter at Serere in November. Both did valuable work in knitting East African entomological research into a coherent whole. The latter meeting produced comments on the values of a large range of insecticidal machinery under local conditions, based on the work of the Research Mechanic. These have been circulated to East African entomologists and to research workers and manufacturers in Britain and to the agents of the latter in East Africa.

The help of the Commonwealth Institute of Entomology and the Pest Infestation Laboratory of the Department of Scientific and Industrial Research is gratefully acknowledged.

The first Entomologist represented Uganda at the Sixth Commonwealth Entomological Conference.

The Senior Entomologist attended the meeting of the Desert Locust Survey Advisory Committee in January.

LOCUSTS

The native Kagera Dwarf Locust (*Faureia milanjica* Karsch) continued to swarm in the south-western districts and to do minor damage to grazing and crops. The red and migratory locusts were kept in control in their outbreak areas in other parts of Africa by the services charged with that duty, to which Uganda subscribes, and invasions were prevented.

The desert locust (*Schistocerca gregaria* Forsk.) has been out of control for some years. Large sums of money are being spent on restricting the outbreak. As a result, Uganda was not seriously invaded, no locusts bred, and no control measures were necessary within the country. In March a few swarms invaded the south-western districts from Tanganyika. In April more swarms invaded the east and north from Kenya. From May to October there was slight activity in the north and east. A dry spell in November brought from Kenya the biggest influx of swarms for some years and affected all the northern half of the country, but in December swarms were again few and confined to the east. The little damage to crops which was reported, was mainly in November.

STORED PRODUCTS

This important subject has been kept well to the fore. It has been proved at Kawanda that maize cobs with good sheaths stored alone in a crib can dry down to 14-13% moisture content and suffer little insect attack although exposed to pests. Improved stores have been designed for various stations. Proposals have been made for reducing losses from pests at the Jinja Grain Conditioning Plant. Other matters have been noted above in the section on Collaboration. Plans for expanding this side of the section's activity have been made.

CEREALS

For several years the subject of stem-borers of cereals has been pursued as a minor project. Damage is ubiquitous but is most serious in the Eastern Province. It now appears that the problem is complex, involving not merely control of the well-known maize stalkborer, *Busseola fusca* Hmps., but also of the caterpillars of a *Chilo* and several species of *Sesamia*. In addition, fly maggots and internal rots are often found inside shoots with dying hearts. The maggots include the central shoot fly (*Atherigona indica infuscata* Emd.) and several species of *Chloropidae*, while the rots remain unidentified. The problem of sorting out this biological complex, deciding which organisms are primary and which secondary, and finding out how much damage is done in different areas and seasons, has now been taken up as a full-time study by an Entomologist, who will gradually extend his studies to cover all cereal pests.

COW PEA MOTTLING AND DWARFING

A severe malady of cow peas, superficially resembling a mosaic disease, has been found to be associated with large numbers of two unidentified species of thrips. It is readily controlled by spraying or dusting with D.D.T. It is therefore presumed to be direct damage by the thrips themselves, but it remains to prove the supposition by cage experiment.

CASSAVA SCALE

The cassava scale, *Aoinidomytilus albus* Ckll., was first recorded for Uganda in a remote area of Lango at the end of 1953, where it did severe damage to cassava locally. It has since been found to be widespread in Mbale and Teso districts, local in east Lango, Busoga and Bunyoro, and reported from one locality each in Mubende, Mengo and Acholi. Although it has evidently been in the country for some years, it is unlikely to be a native, but how it entered Uganda is unknown. There is some circumstantial evidence that it has been spread within the country on cuttings of the new mosaic-resistant cassava varieties. By itself the insect spreads extremely slowly. Though not a serious pest of short-term cassava, the scale can be serious on cassava kept in the ground for a long time as a famine reserve, especially in arid areas and in dry years, which are precisely the circumstances in which the crop is most useful. The survey of the scale throughout the country is not yet complete.

BANANA WEEVIL

The banana weevil, *Cosmopolites sordidus* Germ., continues to do much harm, especially to neglected banana gardens. The people are afraid of biological control, the obvious remedy to try against this foreign pest. A preliminary trial of treating young plants with D.D.T. and aldrin emulsions by dipping and watering showed little advantage from the former but a lower infestation from the latter. Further work on this pest is planned.

TOBACCO

The first Entomologist ended his study of root-knot eelworm, which has lasted nearly three years, half of this period being full-time work. During this period it transpired that the eelworm, previously known as *Heterodera marioni* Cornu, really comprised several species, which are now segregated in the genus *Meloidogyne*. It is not yet known which species are common in Uganda, nor what their host ranges are. It was confirmed that root-knot eelworms are widespread in Uganda in all tobacco areas and perhaps throughout. However, they are unimportant above 5,500 feet and apparently absent above 7,000 feet altitude. They are to be found even in land which is known not to have been cultivated for many years. They may therefore be indigenous. Injection of Shell DD Soil Fumigant has been proved to increase the stand and growth of seedlings greatly. The advantage is reflected in the yield from the plants after transplanting into the field. Injections around transplant sites in the field have given indications of reduced infestations, but the effects on yield were not statistically significant and are not likely to be economic. Although injection improved seedbeds greatly in experimental conditions, it was disappointing when tried out under ordinary practical conditions in the country. It appeared that neglect of elementary care of seedbeds, watering, shading, and so on, limited growth to such an extent, that the injections had no chance to show any good effect. It has been proposed that seedbeds should be reorganised and better supervised in certain districts in order to overcome this difficulty.

COFFEE

Coffee berry borer, *Hypothenemus (Stephanoderes) hampei* Ferr., gave trouble in some areas as usual. Trials of the chemical control measures claimed to be successful in the Congo and Brazil have given inconclusive results, probably through unsuitable land for experimentation. The usual local outbreaks of tailed caterpillar, *Epicampoptera (Metadrepna)* sp., have occurred. The coffee lace bug has been found to include a hitherto unrecognised species, *Habrochila ghesquieri* Schout., recently described from the Congo. This new species is alone present on Mount Elgon, where it continues to spread and cause alarm. Preliminary tests of chemical control there gave only moderate results and need to be extended. Trials of pyrethrum dusting having been more successful against *Antestiopsis (Antestia)* spp., a campaign against these bugs was launched by the Bugisu Coffee Board in the north Bugisu highlands. Although hampered by short supplies of insecticide and hand pumps, it has given the first appreciable crop for several years in some areas. For two years the Elgon lowlands have been devastated by thrips attack. When sufficient experience with the *Antestia* organisation has been gained, it is proposed to organise spraying against thrips also.

COTTON

The long research into chemical control of *Lygus vosseleri* Popp. is emerging from experimentation into practice. Low volume spraying with D.D.T. at 1 lb. per acre is effective, while D.D.T. dusts give variable results. Under certain circumstances spraying doubles the crop. It also makes it ripen earlier, reducing the number of pickings and lengthening the dead season. Efforts are now being applied to reducing the cost of treatment and finding out in what parts of the country it is rendered uneconomic by the power of the plants to recover and set a late crop. In southerly areas there are indications that it may pay to spray late to control bollworms, neglecting the *Lygus*. This is especially true where the increase of maize is giving rise to infestations of American boll worm (*Heliothis armigera* Hb.).

Of late years much attention has been given to methods of sampling the cotton crop for measuring pest incidence.

INSECTICIDE MACHINERY

Closely linked with the *Lygus* control research has been a study of machines and methods for applying insecticides to tropical peasant crops. Over a hundred different types of machine have been tested, ranging from the smallest hand puffers to the smaller types of tractor-drawn machines. Many of them are useful for different purposes, but in general the intermediate barrow type are unsuitable to Uganda conditions. A number of modifications have been suggested to manufacturers. The recommendations of the Research Mechanic are communicated to other East African research workers, and in return we receive advice on insecticides, a subject on which we are unable to do direct research.

UGANDA RAINFALL, 1954

Station	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
ARUA ..	Total: ins.	0.06	2.03	3.60	4.74	5.40	6.94	9.30	10.25	10.87	2.62	0.38	64.25
	Days	1	7	13	16	12	18	17	17	18	6	4	144
GULU ..	Mean: ins.	0.69	1.87	3.27	5.32	5.67	6.05	7.51	6.64	7.15	3.98	1.69	54.59
	Total: ins.	0.18	0.60	3.23	7.85	9.33	6.20	11.66	7.25	5.10	1.27	2.47	59.77
JIRA ..	Days	3	4	10	16	20	19	22	17	14	5	8	134
	Mean: ins.	0.41	1.74	3.33	6.75	7.91	6.68	8.86	6.79	6.40	3.76	1.73	60.16
MOROTO ..	Total: ins.	0.29	1.12	1.19	5.60	7.72	4.33	6.94	5.69	7.62	1.13	1.51	51.21
	Days	5	4	9	15	18	14	21	16	13	3	4	136
SOROTI ..	Mean: ins.	0.97	1.37	3.44	6.71	7.29	5.11	8.74	6.34	5.54	3.10	1.57	55.42
	Total: ins.	0.02	0.00	1.05	9.81	11.63	7.26	7.39	5.15	0.28	1.35	0.65	49.56
TORORO ..	Days	1	0	1	9	13	12	9	5	2	2	5	69
	Mean: ins.	0.27	1.21	2.60	4.88	5.92	5.60	4.24	2.07	1.87	1.76	0.91	34.83
JINJA ..	Total: ins.	0.09	0.48	1.40	6.26	6.10	5.26	5.59	6.16	2.71	0.38	2.19	45.23
	Days	2	2	5	14	15	8	17	12	6	2	6	104
KABALE ..	Mean: ins.	0.75	1.95	2.92	7.15	7.50	4.74	6.97	5.46	4.52	2.83	1.30	51.18
	Total: ins.	1.03	2.55	3.17	8.98	9.51	1.61	4.69	6.85	3.65	1.92	2.09	50.47
MBARARA	Days	4	6	8	16	24	6	16	13	17	10	11	143
	Mean: ins.	1.71	2.71	5.38	8.37	8.50	4.25	4.79	3.98	4.58	3.87	2.66	55.15
FORT PORTAL	Total: ins.	0.35	0.89	0.81	7.33	7.98	4.25	2.61	2.61	3.75	2.46	3.92	39.19
	Days	3	3	6	16	10	10	9	10	10	6	6	97
	Mean: ins.	1.69	1.93	4.00	7.87	6.66	2.91	4.52	4.36	3.74	3.71	3.40	47.21
	Total: ins.	0.34	6.52	2.53	5.10	5.49	1.29	1.83	2.74	3.25	2.30	7.98	42.54
	Days	5	16	12	20	17	4	14	8	22	17	17	159
	Mean: ins.	2.29	3.53	4.69	5.22	3.70	0.82	2.07	3.88	3.85	4.13	3.36	38.64
	Total: ins.	0.10	3.00	3.47	6.92	6.73	0.51	0.93	2.66	2.73	3.09	3.34	35.66
	Days	1	9	12	16	13	3	6	14	16	19	15	132
	Mean: ins.	1.52	2.43	3.78	4.80	3.09	0.82	2.45	3.83	4.12	4.60	2.84	35.29
	Total: ins.	0.61	2.16	4.77	8.33	9.94	4.98	6.20	13.65	13.20	7.38	3.90	83.40
	Days	5	11	16	21	28	18	21	25	31	20	15	230
	Mean: ins.	1.25	2.92	5.34	7.33	5.70	2.30	4.65	7.60	8.37	6.47	2.83	58.06

APPENDIX I—continued

Station		Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
HOIMA ..	Total: ins.	0.10	1.25	4.40	8.33	7.26	4.81	3.22	5.13	7.51	3.22	1.80	3.47	50.50
	Days	2	10	10	16	14	15	10	10	21	12	7	9	136
MASAKA ..	Mean: ins.	1.17	2.81	4.64	6.77	5.94	3.55	3.93	5.86	7.03	6.90	5.15	2.45	56.20
	Total: ins.	0.21	2.02	2.95	8.83	6.87	1.40	0.10	2.61	5.90	2.65	1.82	5.18	40.54
KAKUMIRO	Days	2	5	6	10	11	2	1	9	9	6	5	7	73
	Mean: ins.	2.00	2.44	4.44	7.01	6.83	1.78	1.41	2.16	3.53	3.87	3.80	3.37	42.64
MITYANA ..	Total: ins.	0.00	2.00	2.62	4.54	7.45	5.47	3.97	4.36	13.22	3.32	2.41	5.33	54.69
	Days	0	5	8	15	17	12	9	12	23	12	11	8	132
KAMPALA ..	Mean: ins.	1.32	2.33	4.56	6.62	4.03	2.93	2.64	5.38	6.83	7.12	5.49	2.69	51.94
	Total: ins.	0.94	4.14	1.68	5.06	5.98	4.64	3.64	3.18	3.15	4.06	3.24	3.61	43.32
ENTEBBE ..	Days	4	12	7	13	17	14	9	12	19	15	8	11	141
	Mean: ins.	1.75	2.87	4.16	5.77	4.43	2.38	1.59	3.84	3.81	5.12	4.51	2.88	43.11
ENTEBBE ..	Total: ins.	1.06	3.01	2.98	4.07	5.45	3.05	3.50	4.88	5.92	5.85	1.02	4.87	45.66
	Days	4	11	13	17	15	12	10	11	15	15	5	17	145
ENTEBBE ..	Mean: ins.	1.99	2.24	4.46	7.16	5.51	2.95	1.98	3.40	3.89	4.30	4.50	3.82	46.20
	Total: ins.	1.16	2.16	4.18	7.91	6.12	2.05	3.84	2.33	1.36	1.77	2.59	5.70	41.17
ENTEBBE ..	Days	5	6	14	19	19	11	9	6	6	7	7	11	120
	Mean: ins.	2.61	3.45	6.16	10.13	9.68	4.61	3.03	2.97	3.09	3.66	5.07	4.47	58.93

COTTON PRODUCTION—1953/54 SEASON

PROVINCE AND ZONE	ACREAGE		SALES IN TONS		YIELDS PER ACRE LB.	
	Totals	Means	Totals	Means	Totals	Means
	1953/54	1947/48-1953/54	1953/54	1947/48-1953/54	1953/54	1947/48-1953/54
<i>Buganda—</i>						
Mengo	309,325	325,050	63,394	60,115	459	414
Masaka	28,674	40,562	5,128	7,381	401	408
Mubende	60,075	57,854	11,362	10,661	423	413
TOTALS ..	398,074	423,466	79,884	78,157	450	413
<i>Eastern—</i>						
Busoga	343,085	259,774	54,967	41,528	359	358
North Mbale ..	171,201	163,656	21,603	16,010	283	219
South Mbale ..	162,489	142,980	18,070	12,557	249	197
South Teso ..	65,755	60,172	5,056	5,119	172	191
South Teso Segregated ..	37,078	32,619	4,600	4,071	278	280
North Teso ..	47,974	45,241	4,076	3,859	190	191
Usuku	16,495	14,322	1,756	1,800	238	282
TOTALS ..	844,077*	718,764	110,128†	84,944	292	265
<i>Western—</i>						
Bunyoro	25,277	23,415	5,528	3,885	490	340
Toro	23,199	18,993	3,332	2,465	321	274
TOTALS ..	48,476	42,408	8,860	6,350	405	307
<i>Northern—</i>						
Lango	178,682	171,377	16,678	15,365	209	207
East Acholi and Karamoja ..	35,955	33,904	3,665	3,978	228	262
West Acholi ..	33,495	33,664	5,604	4,449	375	296
West Nile ..	72,464	50,564	8,794	5,146	271	227
TOTALS ..	320,596*	289,509	34,741†	28,938	243	224
PROTECTORATE TOTALS ..	1,611,223	1,474,147	233,613	198,389	325	301

*These figures do not agree with Provincial totals as shown in Tables III (a), III (c), and III (e) due to the fact that the boundaries of the zones listed under Eastern and Northern provinces do not coincide with provincial boundaries. The difference is compensating and the Protectorate totals in Tables II (a) and III (a) agree.

†Similarly these figures do not agree with those in Table IV; the Protectorate totals, however, agree.

COTTON PRODUCTION—1954/55 SEASON

Monthly Plantings—Acres

Province and Zone	April	May	June	July	August	September	TOTAL
<i>Buganda—</i>							
Mengo ..	--	691	78,576	153,685	96,696	3,528	333,176
Masaka ..	--	285	7,660	3,409	13,158	9,771	34,283
Mubende ..	--	140	14,682	28,153	21,149	359	64,483
TOTAL ..	—	1,116	100,918	185,247	131,003	13,658	431,942
<i>Eastern—</i>							
Busoga ..	—	9,116	61,916	149,444	105,355	30,800	356,631
North Mbale ..	13	9,093	52,962	72,245	50,535	6,450	191,298
South Mbale ..	—	3,130	32,182	66,293	46,795	4,856	153,256
South Teso ..	198	10,807	23,566	15,317	8,895	1,696	60,479
South Teso Segregated ..	3	4,112	14,374	9,855	9,260	1,063	38,667
North Teso ..	83	10,894	27,188	17,073	5,095	110	60,443
Usuku ..	1,476	10,021	5,353	686	5	—	17,541
TOTAL ..	1,773	57,173	217,541	330,913	225,940	44,975	878,315*
<i>Western—</i>							
Bunyoro ..	—	1,250	7,250	15,000	6,750	75	30,325
Toro ..	—	—	172	12,580	15,415	7,367	35,534
TOTAL ..	—	1,250	7,422	27,580	22,165	7,442	65,859
<i>Northern—</i>							
Lango ..	27	3,644	66,475	91,660	32,467	2,455	196,908
East Acholi and Karamoja ..	46	3,346	18,056	28,763	11,102	—	61,313
West Acholi ..	—	271	8,825	22,926	10,770	—	42,792
West Nile ..	—	—	5,745	25,122	30,414	411	61,692
TOTAL ..	73	7,261	99,101	168,471	84,933	2,866	362,705*
PROTECTORATE TOTAL ..	1,846	66,800	424,982	712,211	464,041	68,941	1,738,821

*These figures do not agree with those in Tables III (a), III (c), and III (e) due to the fact that the boundaries of the zones listed under Eastern and Northern provinces do not coincide with the provincial boundaries. The differences are compensating; the Protectorate totals agree.

COTTON

Monthly Plantings as Percentages of Total

— 1954/55 ---- MEAN 1949/50-1953/54 1953/54

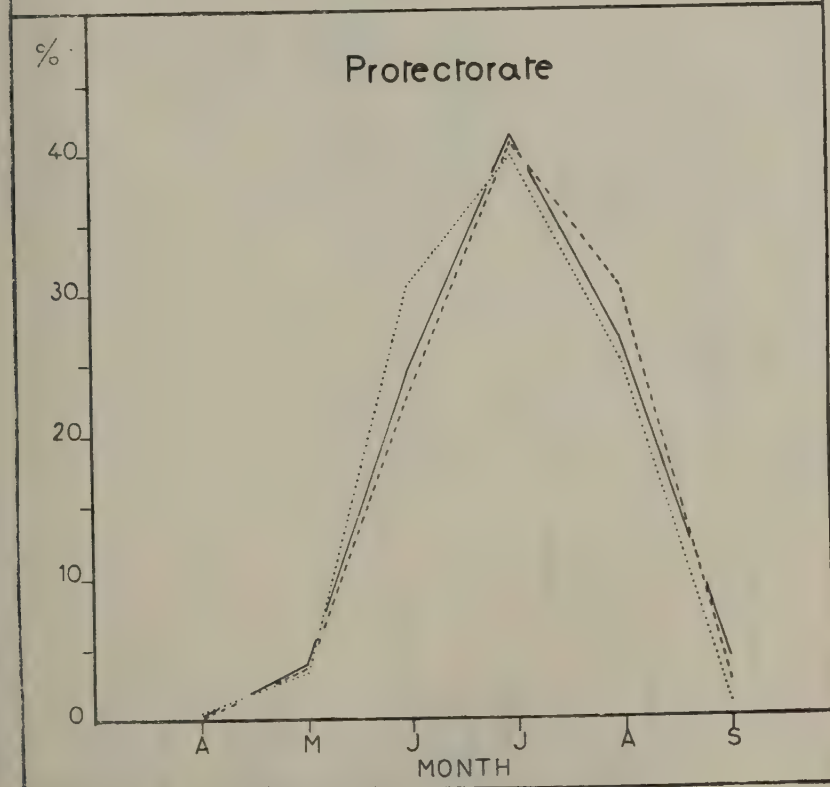
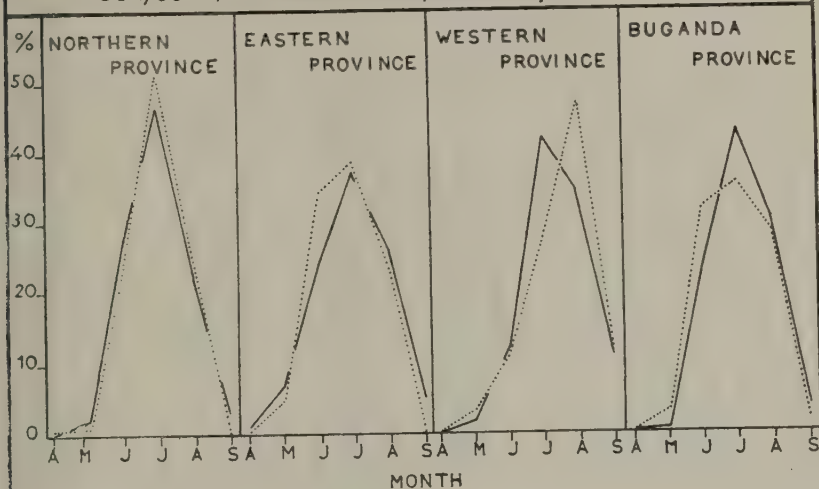


FIG VII

COTTON—MONTHLY PLANTINGS AS PERCENTAGES OF TOTAL

Province and Zone	APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER	
	1954-55	Mean 1949-50 1953-54	1954-55	Mean 1949-50 1953-54	1954-55	Mean 1949-50 1953-54	1954-55	Mean 1949-50 1953-54	1954-55	Mean 1949-50 1953-54	1954-55	Mean 1949-50 1953-54
<i>Buganda Province—</i>												
Mengo ..	—	—	0.2	0.5	23.6	17.1	46.1	40.1	29.0	37.6	1.1	4.7
Masaka ..	—	—	0.8	5.5	22.3	20.2	9.9	25.4	38.4	29.5	28.5	19.4
Mubende ..	—	—	0.2	3.0	22.8	20.6	43.7	34.5	32.8	36.3	0.5	5.6
AVERAGE ..	—	—	0.2	1.3	23.4	17.8	42.9	38.0	30.3	36.7	3.2	6.2
<i>Eastern Province—</i>												
Busoga ..	—	—	2.6	4.4	17.4	25.8	41.9	40.8	29.5	28.7	8.6	0.3
North Mbale ..	—	—	4.8	4.3	27.7	24.5	37.7	40.4	26.4	30.8	3.4	—
South Mbale ..	—	—	2.0	2.8	21.0	21.6	43.2	48.0	30.5	27.6	3.2	—
South Teso ..	0.3	0.3	17.9	11.9	39.0	35.1	25.3	33.5	14.7	19.2	2.8	—
South Teso Segregated ..	—	0.1	10.6	10.1	37.2	34.1	25.5	30.5	23.9	25.2	2.8	—
North Teso ..	0.1	0.1	18.0	8.2	45.0	39.9	28.3	33.6	8.4	18.2	0.2	—
Usuku ..	8.4	7.3	57.2	43.6	30.5	35.1	3.9	12.8	—	1.2	—	—
AVERAGE ..	0.2	0.2	6.5	5.9	24.8	26.9	37.7	40.1	25.7	26.8	5.1	0.1
<i>Western Province—</i>												
Bunyoro ..	—	—	4.1	3.0	23.9	23.2	49.5	46.0	22.3	24.9	0.2	2.9
Toro ..	—	—	—	—	0.5	0.5	35.4	8.8	43.4	57.3	20.7	33.4
AVERAGE ..	—	—	1.8	1.6	11.3	12.3	41.9	28.2	33.7	40.4	11.3	17.5
<i>Northern Province—</i>												
Lango ..	—	0.3	1.9	1.3	33.8	21.5	46.5	46.5	16.5	29.7	1.3	0.7
East Acholi and Karamoja ..	0.1	—	5.5	1.2	29.4	17.4	46.9	52.6	18.1	27.7	—	1.1
West Acholi ..	—	—	0.6	0.8	20.6	17.8	53.6	52.6	25.2	28.4	—	0.4
West Nile ..	—	—	—	0.7	9.3	20.8	40.7	48.6	49.3	28.3	0.7	1.6
AVERAGE ..	—	0.2	2.0	1.1	27.3	20.5	46.5	48.3	23.4	29.0	0.8	0.9
PROTECTORATE AVERAGE	0.1	0.1	3.8	3.6	24.4	22.6	41.0	40.7	26.7	30.5	4.0	2.5

COTTON PRODUCTION

(No. of Bales of 400 lb. 1907-54)

(Note.—All figures are corrected to 1,000 bales)

Season	Bales (Actual)	Bales (5-year average)	Season	Bales (Actual)	Bales (5-year average)
1907	2,000	—	1930-31 ..	189,000	204,000
1908	4,000	—	1931-32 ..	207,000	220,000
1909	5,000	9,000	1932-33 ..	295,000	246,000
1910	12,000	13,000	1933-34 ..	286,000	271,000
1911	20,000	21,000	1934-35 ..	253,000	296,000
1912-13 ..	26,000	25,000	1935-36 ..	316,000	321,000
1913-14 ..	40,000	27,000	1936-37 ..	332,000	325,000
1914-15 ..	26,000	28,000	1937-38 ..	418,000	335,000
1915-16 ..	22,000	29,000	1938-39 ..	307,000	344,000
1916-17 ..	28,000	26,000	1939-40 ..	300,000	326,000
1917-18 ..	27,000	30,000	1940-41 ..	365,000	264,000
1918-19 ..	36,000	44,000	1941-42 ..	238,000	241,000
1919-20 ..	47,000	48,000	1942-43 ..	112,000	236,000
1920-21 ..	81,000	60,000	1943-44 ..	191,000	208,000
1921-22 ..	48,000	78,000	1944-45 ..	272,000	207,000
1922-23 ..	88,000	108,000	1945-46 ..	227,000	218,000
1923-24 ..	128,000	128,000	1946-47 ..	231,000	258,000
1924-25 ..	196,000	145,000	1947-48 ..	170,000	272,000
1925-26 ..	180,000	155,000	1948-49 ..	391,000	295,000
1926-27 ..	131,000	170,000	1949-50 ..	339,000	325,000
1927-28 ..	138,000	156,000	1950-51 ..	346,000	355,000
1928-29 ..	204,000	157,000	1951-52 ..	380,000	357,000
1929-30 ..	125,000	173,000	1952-53 ..	320,000	—
			1953-54 ..	398,000	—

CROP PRODUCTION
Estimated Acreages under Crops—1953 and 1954
African Cultivation

Crop	BUGANDA		EASTERN		NORTHERN		WESTERN		TOTAL	
	1953	1954	1953	1954	1953	1954	1953	1954	1953	1954
Beans, Mixed ..	230,040	213,159	160,841	148,441	138,668	136,736	109,631	107,204	639,180	605,540
Bean, Soya ..	1,246	10,335	—	5	—	388	2,201	2,556	3,447	13,284
Cassava ..	63,506	64,282	341,604	251,338	235,766	206,795	118,589	71,336	759,465	593,751
Chillies ..	154	15	—	—	—	—	17	8	171	23
Coffee, Arabica ..	1,400	1,400	14,000	17,000	21	50	5,115	5,372	20,536	23,822
Coffee, Robusta ..	203,971	253,048	620	1,104	15	15	7,126	7,661	211,717	261,828
Cotton ..	398,074	431,942	867,288	904,326	297,385	336,694	48,476	65,859	1,611,223	1,738,821
Flax ..	—	—	—	—	—	—	506	470	506	470
Gram ..	26,258	18,366	—	—	81	3,492	—	16	26,339	21,874
Groundnuts ..	76,714	87,693	235,769	173,589	70,842	92,823	23,700	22,684	407,025	376,789
Maize ..	346,609	229,525	209,549	138,790	42,967	46,933	62,777	56,444	661,902	471,692
Millet, Sorghum ..	63,739	27,077	172,650	178,593	241,991	270,473	177,639	186,007	656,019	662,150
Millet, Finger ..	32,564	27,833	721,973	724,432	333,573	340,877	134,017	131,964	1,222,127	1,225,106
Millet, Bulrush ..	—	—	—	2,754	2,411	3,543	—	—	2,411	6,297
Onions ..	—	—	—	2	—	—	1,847	1,993	1,847	1,995
Peas, Pigeon ..	—	—	—	1,465	210,145	228,066	243	672	210,388	230,203
Peas, Field ..	—	—	—	—	—	—	27,778	28,794	27,778	28,794
Plantains ..	500,522	570,881	283,800	587,685	750	840	358,764	367,958	1,143,836	1,527,364
Potatoes, Sweet ..	159,852	141,550	198,684	186,770	142,672	92,558	142,515	141,094	643,723	561,972
Potatoes, English ..	—	—	2,629	3,122	9,024	9,195	11,653	11,653	12,317	12,317
Rice ..	—	—	2,388	4,278	2,659	1,133	7,065	2,620	12,112	8,031
Simsim ..	6,186	7,094	20,559	28,761	178,470	211,394	6,851	6,485	212,066	253,734
Sunflower ..	—	—	—	—	980	873	87	51	1,067	924
Tobacco, Flue-cured ..	—	—	—	—	1,778	2,337	—	157	1,778	2,494
Tobacco, Fire-cured ..	640	697	—	28	—	—	3,913	3,519	4,553	4,244
Tobacco, Air-cured ..	183	330	—	—	1,262	1,285	133	190	1,578	1,805
Wheat ..	—	—	522	126	—	—	515	7,039	1,037	7,165
Bambara Nuts ..	—	—	—	430	—	—	—	—	—	430
Sunn-Hemp ..	—	—	38	136	—	—	—	—	—	136
Total ..	2,111,658	2,085,227	3,232,914	3,353,175	1,902,421	1,977,305	1,248,529	1,227,348	8,495,522	8,643,055

CROP PRODUCTION
Estimated Acreages under Crops—1953 and 1954
African Cultivation
BUGANDA PROVINCE

Crop	Mengo		Masaka		Mubende		Provincial Total	
	1953	1954	1953	1954	1953	1954	1953	1954
Beans, Mixed ..	181,806	152,472	33,989	41,726	14,245	18,961	230,040	213,159
Beans, Soya ..	1,246	4,575	—	5,760	—	—	1,246	10,335
Cassava ..	47,222	41,694	7,851	9,686	8,433	12,902	63,506	64,282
Chillies ..	—	—	139	—	15	15	154	15
Coffee, Arabica ..	1,200	1,200	100	100	100	100	1,400	1,400
Coffee, Robusta ..	135,111	176,785	62,881	66,299	5,979	9,964	203,971	253,048
Cotton ..	348,577	372,222	28,674	34,283	20,823	25,437	398,074	431,942
Gram ..	23,827	16,749	2,431	1,617	—	—	26,258	18,366
Groundnuts ..	55,291	59,960	15,113	16,864	6,310	10,869	76,714	87,693
Maize ..	289,344	180,619	52,362	44,096	4,903	4,810	346,609	229,525
Millet, Sorghum ..	37,863	10,411	22,177	12,813	3,699	3,853	63,739	27,077
Millet, Finger ..	23,105	20,583	3,072	3,245	6,387	4,005	32,564	27,833
Plantains ..	290,959	333,121	161,290	177,419	48,273	60,341	500,522	570,881
Potatoes, Sweet ..	120,437	97,732	24,224	24,662	15,191	19,156	159,852	141,550
Potatoes, English ..	—	—	—	—	—	—	—	—
Simsim ..	5,630	5,424	—	—	556	1,670	6,186	7,094
Tobacco, Fire-cured ..	—	—	—	—	640	697	640	697
Tobacco, Air-cured ..	—	—	—	—	183	330	183	330
Total ..	1,561,618	1,473,547	414,303	438,570	135,737	173,110	2,111,658	2,085,227

CROP PRODUCTION

Estimated Acreages under Crops—1953 and 1954
African Cultivation
EASTERN PROVINCE

Crop	BUSOGA		MBALE		TESO		PROVINCIAL TOTAL	
	1953	1954	1953	1954	1953	1954	1953	1954
Beans, Mixed	7,455	19,322	84,572	59,145	68,814	69,974	160,841	148,441
Beans, Soya	—	—	—	—	—	5	—	5
Cassava	74,857	78,967	112,310	91,485	154,437	80,886	341,604	251,338
Coffee, Arabica	—	—	14,000	17,000	—	—	14,000	17,000
Coffee, Robusta	—	—	—	—	—	—	620	1,104
Cotton	620	1,104	285,905	295,634	238,298	252,061	867,288	904,326
Groundnuts	343,085	356,631	52,297	40,070	118,591	89,638	235,769	173,589
Maize	64,881	43,881	64,618	85,314	1,430	7,257	209,549	138,790
Millet, Sorghum	143,501	46,219	25,320	27,071	146,063	150,471	172,650	178,593
Millet, Finger	1,267	1,051	—	—	251,640	290,823	721,973	724,432
Millet, Bulrush	208,193	181,967	262,140	251,642	—	2,754	—	2,754
Onions	—	—	—	—	—	2	—	2
Peas, Pigeon	—	—	—	—	—	1,465	—	1,465
Plantains	182,000	182,000	100,000	405,385	1,800	300	283,800	587,685
Potatoes, Sweet	85,011	49,240	33,671	57,305	80,002	80,225	198,684	186,770
Potatoes, English	—	—	2,629	3,122	—	—	2,629	3,122
Rice	46	2,424	315	176	2,027	1,678	2,388	4,278
Simsim	1,447	1,569	963	1,010	18,149	26,182	20,559	28,761
Tobacco, Fire-cured	—	—	—	—	—	28	—	28
Wheat	—	—	522	126	—	—	522	126
Bambara Nuts	—	—	—	—	—	430	—	430
Sunn-Hemp	—	—	—	—	38	136	38	136
TOTAL	1,112,363	964,375	1,039,262	1,334,485	1,081,289	1,054,315	3,232,914	3,353,175

CROP PRODUCTION
Estimated Acreages under Crops—1953 and 1954
African Cultivation
WESTERN PROVINCE

Crop	ANKOLE		BUNYORO		KIGEZI		TORO		TOTAL	
	1953	1954	1953	1954	1953	1954	1953	1954	1953	1954
Beans, Mixed	17,512	13,911	11,230	11,000	49,896	46,417	30,993	35,876	109,631	107,204
Beans, Soya	2,123	2,468	—	—	—	50	78	38	2,201	2,556
Cassava	8,090	5,315	22,732	17,576	2,319	2,385	85,448	46,060	118,589	71,336
Chillies	—	—	—	—	—	5	17	3	—	8
Coffee, Arabica	2,673	2,825	—	—	520	545	1,922	2,002	5,115	5,372
Coffee, Robusta	3,606	3,993	750	830	429	417	2,341	2,421	7,126	7,661
Cotton	—	—	25,277	30,325	—	—	23,199	35,534	48,476	65,859
Flax	116	128	—	—	390	342	—	—	506	470
Gram	—	16	—	—	—	—	—	—	—	16
Groundnuts	12,545	6,557	3,927	4,834	2,967	3,366	4,261	7,927	23,700	22,684
Maize	6,627	3,841	6,787	6,016	27,705	23,484	21,658	23,103	62,777	56,444
Millet, Sorghum	15,824	12,345	1,191	1,318	155,303	168,614	5,321	3,730	177,639	186,007
Millet, Finger	34,691	31,951	19,187	14,877	52,138	54,733	28,001	30,403	134,017	131,964
Onions	1,050	960	94	216	314	384	389	433	1,847	1,993
Peas, Field	6,998	4,418	—	—	20,579	24,302	243	74	27,778	28,794
Peas, Pigeon	—	—	—	487	—	—	201	185	243	672
Plantains	262,828	263,451	18,927	19,000	56,548	64,327	20,461	21,180	358,764	367,958
Potatoes, Sweet	27,867	20,491	14,251	12,608	84,608	93,002	15,789	14,993	142,515	141,094
Potatoes, English	—	30	28	5	8,599	9,032	397	128	9,024	9,195
Rice	—	—	6	—	—	—	7,059	2,620	7,065	2,620
Simsim	—	6	6,682	6,363	—	—	169	116	6,851	6,485
Sunflower	—	—	—	—	87	51	—	—	87	51
Tobacco, Air-cured	—	—	10	—	123	190	—	—	133	190
Tobacco, Fire-cured	—	—	3,913	3,519	—	—	—	—	3,913	3,519
Tobacco, Flue-cured	—	—	—	—	—	157	—	—	—	157
Wheat	—	—	—	—	426	6,761	89	278	—	7,039
TOTAL	402,550	372,706	134,992	128,974	462,951	498,564	248,036	227,104	1,248,529	1,227,348

CROP PRODUCTION
Estimated Acreages under Crops—1953 and 1954
African Cultivation
NORTHERN PROVINCE

Crop	LANGO		ACHOLI		WEST NILE/MADI		KARAMOJA		TOTAL	
	1953	1954	1953	1954	1953	1954	1953	1954	1953	1954
Beans, Mixed	48,532	54,003	23,998	26,249	66,138	56,484	—	—	138,668	136,736
Beans, Soya	—	388	—	—	—	—	—	—	—	388
Cassava	69,376	61,892	36,426	34,747	129,864	110,056	100	100	235,766	206,795
Coffee, Arabica	—	—	—	—	21	50	—	—	21	50
Coffee, Robusta	—	—	—	—	—	15	—	—	—	15
Cotton	158,938	176,450	65,743	96,583	72,464	61,692	240	1,969	297,385	336,694
Gram	81	—	—	—	—	3,492	—	—	81	3,492
Groundnuts	29,596	41,062	24,475	29,517	16,171	21,594	600	650	70,842	92,823
Maize	6,762	8,968	2,213	2,372	31,992	33,593	2,000	2,000	42,967	46,933
Millet, Sorghum	152,953	165,769	28,863	40,037	30,175	24,667	30,000	40,000	241,991	270,473
Millet, Finger	*167,399	*172,469	80,929	87,997	83,245	77,911	2,000	2,500	333,573	340,877
Millet, Bulrush	—	—	911	1,543	—	—	1,500	2,000	2,411	3,543
Peas, Pigeon	*167,399	*172,469	36,000	50,000	6,746	5,597	—	—	210,145	228,066
Plantains	750	268	—	—	—	572	—	—	750	840
Potatoes, Sweet	47,765	29,280	44,039	22,832	49,868	39,446	1,000	1,000	142,672	92,558
Rice	2,117	615	176	139	366	379	—	—	2,659	1,133
Simsim	90,727	99,033	51,101	74,050	36,442	38,061	200	250	178,470	211,394
Sunflower	—	—	—	—	980	873	—	—	980	873
Tobacco, Air-cured	—	—	6	—	1,256	1,285	—	—	1,262	1,285
Tobacco, Flue-cured	51	84	625	750	1,102	1,503	—	—	1,778	2,337
TOTAL	942,446	982,750	395,505	466,816	526,830	477,270	37,640	50,469	1,902,421	1,977,305

* Interplanted

APPENDIX IV

Province/District	Coffee		Air-cured		Tobacco		Fire-cured		Total Value	Total Value
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	1954	1953
	Tons	£	Tons	£	Tons	£	Tons	£	£	£
<i>Eastern Province—</i>										
Busoga	—	—	—	—	—	—	—	—	3,002,518	2,654,577
Mbale	*3,12	—	—	—	—	—	—	—	3,217,894	2,021,302
Teso	—	—	—	—	—	—	—	—	1,214,068	1,344,085
TOTAL ..	3,12	—	—	—	—	—	—	—	7,434,480	5,785,456
<i>Northern Province—</i>										
Lango	—	—	—	—	—	—	—	—	864,557	680,585
Acholi	—	—	—	—	—	—	—	—	466,736	382,037
Karamoja	—	—	—	—	—	—	—	—	448	2,150
West Nile/Madi ..	\$ 153	12,254	—	—	—	—	—	—	502,014	256,981
TOTAL ..	153	12,254	—	—	—	—	—	—	1,833,755	1,321,753
<i>Western Province—</i>										
Bunyoro	—	—	—	—	743	61,649	—	—	374,791	303,298
Toro	\$10	—	—	—	—	—	—	—	380,178	176,674
Ankole	\$3	—	—	—	—	—	—	—	34,265	16,413
Kigezi	\$ 12	701	—	—	—	—	—	—	7,676	1,002
TOTAL ..	15	701	—	—	743	61,649	—	—	796,910	497,387
<i>Buganda Province—</i>										
Mengo	+57	—	—	—	—	—	—	—	8,485,957	6,253,035
Masaka	+10	—	—	—	—	—	—	—	2,503,811	1,934,679
Mubende	+9	57	4,844	133	11,099	—	—	—	276,198	185,450
TOTAL ..	77	4,844	133	11,099	—	—	—	—	11,265,966	8,373,164
PROTECTORATE TOTALS ..	4,04	17,799	876	72,748	—	—	—	—	21,331,111	16,212,268

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APPENDIX V (a)

PORT OF AGRICULTURAL PRODUCTS, 1954

UNIT	QUANTITIES			VALUE IN £		
	1952	1953	1954	1952	1953	1954
<i>Tons</i> ..	28,151	32,144	295	634,312	639,510	5,882
<i>Tons</i> ..	11,575	14,990	7,621	816,558	850,002	320,399
<i>Tons</i> ..	1,834	1,013	7,718	109,603	63,874	541,808
<i>Tons</i> ..	—	25	48	—	1,219	1,920
<i>Tons</i> ..	—	—	516	—	—	40,685
<i>Tons</i> ..	—	—	365	—	—	12,848
<i>Tons</i> ..	25,736	33,410	59,782	562,719	796,928	1,559,538
<i>Tons</i> ..	341	452	—	7,822	14,773	—
<i>Tons</i> ..	—	—	47	—	—	985
<i>Tons</i> ..	—	—	2,575	—	—	298,873
<i>Tons</i> ..	—	—	122	—	—	17,096
<i>Tons</i> ..	1,647	3,093	—	200,384	351,126	—
<i>Tons</i> ..	5,388	858	815	114,067	21,246	27,771
<i>Tons</i> ..	67,954	59,222	70,242	29,953,559	16,802,041	20,877,232
<i>Tons</i> ..	736	972	535	117,965	83,037	31,504
<i>Tons</i> ..	7	21	20	1,800	3,656	2,088
<i>Tons</i> ..	39,425	35,679	34,647	12,345,092	11,543,404	13,477,528
<i>Tons</i> ..	949	1,250	2,194	281,476	355,656	950,032
<i>Tons</i> ..	64	56	—	12,401	12,557	—
<i>Lb.</i> ..	491,026	117,097	106,617	55,346	11,147	9,182
<i>Tons</i> ..	549	538	353	74,711	81,581	77,478
<i>Tons</i> ..	8	15	—	1,011	2,274	—
<i>Tons</i> ..	12	22	31	43,944	73,392	48,007
<i>Tons</i> ..	—	—	3	—	—	6,540
<i>Tons</i> ..	212	673	1,257	9,268	32,941	53,754
<i>Tons</i> ..	6,741	2,944	2,895	266,854	119,394	86,442
<i>Tons</i> ..	—	—	4,400	—	—	293,595
<i>Tons</i> ..	154	29	10	4,252	905	410
<i>Tons</i> ..	146	45	45	43,456	11,450	7,384
<i>Tons</i> ..	1,098	523	122	31,668	12,151	2,630
<i>Proof Gals.</i>	64	203	484	23	70	184
			TOTAL £	45,688,291	31,884,334	38,751,795

EXPORTS OF AGRICULTURAL PRODUCTS TO KENYA AND TANGANYIKA, 1954

ARTICLE	UNIT	QUANTITY		VALUE IN £		
		To Kenya	To Tanganyika	Total	To Kenya	To Tanganyika
<i>Oilseeds and Products :</i>						
Cotton Seed Cake ..	Tons ..	828	—	828	19,853	—
Other Oilseed Cakes and other vegetable oil residues ..	Tons ..	266	—	266	5,397	—
Sesame Seed ..	Tons ..	10	—	10	708	—
Groundnuts ..	Tons ..	20	366	386	1,257	24,089
Cotton Seed Oil ..	Tons ..	3,630	1,549	5,179	359,565	162,444
Groundnut Oil ..	Tons ..	23	85	108	3,177	10,594
Other Vegetable Oils ..	Tons ..	29	39	68	4,280	5,286
<i>Fibres:</i>						
Cotton Raw ..	Tons ..	42	6	48	4,269	518
<i>Beverage Crops and Tobacco:</i>						
Coffee, not roasted ..	Tons ..	13	—	13	5,109	—
Tea ..	Tons ..	21	6	27	8,277	2,358
Cigars, Cheroots and manufactured tobacco ..	Lb. ..	95,628	20,020	115,648	67,715	14,142
<i>Beans and Pulses:</i>						
Beans, Peas, Lentils, etc. ..	Tons ..	3,060	1,603	4,663	60,724	30,288
<i>Cereals:</i>						
Maize ..	Tons ..	40,673	17,217	57,890	1,122,440	475,349
Millet ..	Tons ..	75	506	581	2,343	16,146
Other Cereals ..	Tons ..	—	15	15	—	326
<i>Miscellaneous:</i>						
Rubber ..	Tons ..	22	—	22	3,643	—
Ethyl Alcohol ..	Proof Gals. ..	6,209	243	6,452	1,795	79
Chillies ..	Tons ..	16	2	18	2,347	271
				Total	1,672,899	741,890
				£		
				2,414,789		

CROP PRODUCTION—UGANDA

Non-African Production, 1954

Crop	ESTIMATED ACREAGE		ESTIMATED PRODUCTION			
	1953	1954	Quantity		Value	
			1953	1954	1953	1954
			tons	tons	£	£
Coffee (Robusta)	19,714	*17,767	5,921	5,277	1,846,697	2,100,993
Coffee (Arabica)	3,111	*2,281	419	632	162,397	322,892
Rubber ..	7,000	7,000	45	45	11,450	7,384
Sugar ..	26,547	28,026	47,973	40,812	2,146,484	1,957,170
Sisal ..	9,000	9,000	900	1,200	60,000	72,000
Tea ..	8,397	9,278	2,140	2,797	599,241	1,174,698
TOTAL ..	73,769	73,352	—	—	4,826,269	5,635,137

* In Bearing Acreage: Robusta 3,155; Arabica 284½

POPULATION AND AVAILABILITY OF LAND

APPENDIX VII

Province/District	Total Area <i>Sq. miles</i>	Areas of land excluding open water and reserved forest <i>Sq. miles</i>	Cultivated Area <i>Acres</i>	Population*	Population Density <i>Per sq. mile</i>	Cultivated land per head of the Population <i>Acres</i>	Estimated available land per head of the Population <i>Acres</i>	Ratio of available land to land used
<i>Buganda—</i>								
Mengo ..	14,589	10,048	1,109,041	899,596	90	1.2	7.1	6.0
Masaka ..	8,122	3,968	368,251	317,688	80	1.2	8.0	6.7
Mubende ..	2,679	2,584	138,825	84,878	33	1.6	19.5	12.2
TOTAL ..	25,390	16,600	1,616,117	1,302,162	78	1.2	8.2	6.8
<i>Eastern Province—</i>								
Busoga ..	6,876	3,399	659,302	505,998	149	1.3	4.3	3.3
Bugisu, Bukedi ..	3,367	2,869	1,111,430	599,950	209	1.9	3.1	1.6
Teso ..	4,990	4,519	739,851	402,564	89	1.8	7.2	4.0
TOTAL ..	15,233	10,787	2,510,583	1,508,512	140	1.7	4.6	2.7
<i>Northern Province—</i>								
Acholi ..	11,176	10,703	362,250	215,655	20	1.7	31.8	18.7
Lango ..	4,898	4,519	622,618	265,890	59	2.3	10.9	4.7
Karamoja ..	11,472	10,336	50,019	125,567	12	0.4	52.7	131.7
West Nile/Madi ..	6,061	5,294	567,615	336,063	63	1.7	10.1	5.9
TOTAL ..	33,607	30,852	1,602,502	943,175	31	1.7	20.9	12.3
<i>Western Province—</i>								
Bunyoro ..	6,011	4,198	119,785	108,380	26	1.1	24.8	22.5
Toro ..	5,380	4,319	155,318	258,873	60	0.6	10.7	17.8
Ankole ..	6,320	5,621	356,061	400,924	71	0.9	9.0	10.0
Kigezi ..	2,040	1,757	345,157	395,529	225	0.9	2.8	3.1
TOTAL ..	19,751	15,895	976,321	1,163,706	73	0.8	8.7	10.9
PROTECTORATE TOTAL ..	93,981	74,134	6,705,523	4,917,553	66	1.4	9.6	6.9

* 1948 Census figures

DEPARTMENT OF AGRICULTURE STAFF POSTINGS AS AT 31ST DECEMBER, 1954

A. Administrative

Title	Name	Station	Remarks
<i>Director of Agriculture</i>	J. G. M. KING, O.B.E.	Entebbe	Arrived 17-3-54 on transfer from Basutoland.
<i>Deputy Director of Agriculture</i>	W. J. MILL IRVING, O.B.E.	Entebbe	Proceeded on leave 26-10-54 pending retirement.
<i>Deputy Director of Agriculture</i>	J. T. MOON	Entebbe	With effect from 26-10-54.
<i>Assistant Director of Agriculture</i>	D. R. N. BROWN	Entebbe.	
<i>Administrative Secretary</i>	E. B. BUCKINGHAM	Entebbe.	
<i>Office Superintendent</i>	LT.-COL. D. MACDONALD	Kawanda.	
<i>Stenographer Secretaries</i>	Miss B. E. WRAY	Entebbe.	
	Mrs. J. M. LEMON	Kampala	
	Miss R. C. RICHMOND	Entebbe.	Proceeded on leave 16-10-54, pending resignation.

B. General Division

Title	Name	Station	Remarks
<i>Assistant Director of Agriculture (Special Development)</i>	R. K. KERKHAM	Kawanda.	
<i>Assistant Director of Agriculture (Field)</i>	D. F. STEWART	Jinja	Provincial Agricultural Officer, Eastern Province.
<i>Senior Agricultural Officers and Agricultural Officers</i>	R. P. DAVIDSON	Fort Portal	Provincial Agricultural Officer, Western Province.
	G. D. BADGER	Gulu	Provincial Agricultural Officer, Northern Province.
	G. W. ANDERSON	Entebbe.	
	A. E. B. WILLIAMS	Jinja.	
	D. D. CAMPBELL, M.C.	Mbale	Proceeded on leave 3-10-54.
	D. J. PARSONS, M.C.	Sere.	
	E. S. T. MARSHALL	Soroti.	
	D. C. TODD	Bukalasa.	

<i>Principal Field Officer (Agriculture)</i>	..	MAJOR W. H. EDWARDS, M.C.	..	Kampala	Provincial Agricultural Officer, Buganda.
<i>Senior Field Officers and Field Officers (Agriculture)</i>	..	R. G. HAMPSON, D.F.C.	..	Masaka.	
	..	J. R. LOW	..	Lira.	
	..	E. W. KING	..	Kabale.	
	..	D. INNES	..	Kawanda	Proceeded on leave 21-12-54.
	..	R. B. JOHNSTON	..	Mbarara.	
	..	R. J. HARVIE	..	Fort Portal.	
	..	E. H. JONES	..	Entebbe.	
	..	A. G. OUSELEY-SMITH	..	Mbale.	
	..	A. R. DUNBAR	..	Hoima.	
	..	C. R. HORRELL	..	Serere.	
	..	W. HADLOW	..	Arua.	New appointment. Arrived 16-9-54.
	..	T. E. F. WEAVING	..	Gulu	New appointment. Arrived 31-8-54.
	..	A. D. H. JOBLIN	..	Jinja	New appointment. Arrived 22-8-54.
	..	R. E. H. ATKINSON	..	Kampala	New appointment. Arrived 20-8-54.
	..	A. D. R. KER	..	Bukalasa	
	..	J. F. LOW	..	Serere.	
	..	T. BOOTHROYD	..	Kampala.	
	..	L. B. ELLIS	..	Kawanda.	
	..	CAPT. T. G. DUNCAN, M.C.	..	Masaka.	
	..	G. OLIVER	..	Ngetta.	
	..	G. A. FENNELL	..	Kabale	Proceeded on leave 14-10-54.
	..	A. G. K. WILL	..	Mbale	Seconded to Bugisu Coffee Scheme.
	..	L. GREEN	..	Kawanda.	
	..	J. G. WILSON	..	Moroto.	
	..	J. P. M. BATTEN	..	Kampala.	
	..	J. L. MCCUMISKEY	..	Bunya.	
	..	A. E. MUSSARD	..	Masaka.	Seconded to Bugisu Coffee Scheme.
	..	W. P. BEATTIE	..	Mbale	
	..	J. G. SMITHSON	..	Kawanda.	Arrived on first appointment 1-2-54.
	..	A. J. S. ARMITAGE	..	Gulu	Arrived on first appointment 27-11-54.
	..	H. D. C. TARTLTON	..	Masindi	
	..	G. J. WEBB	..	Kawanda.	
<i>Mechanic</i>	..	T. R. JONES	..	Serere.	

C. Laboratory Division

Title	Name	Station	Remarks
<i>Chief Research Officer</i>	J. D. JAMESON, O.B.E.	Kawanda.	
<i>Senior Entomologist and Entomologists</i>	A. P. G. MICHELMORE	Kawanda.	Seconded to East Africa Locust Survey Organisation.
	P. R. STEPHENSON	—	New appointment. Arrived 31-5-54.
<i>Senior Chemist and Chemist</i>	W. R. INGRAM	Serere	
	Dr. E. M. CHENERY	Kawanda.	On Fulbright Scholarship. Left Entebbe 1-8-54.
<i>Senior Botanist and Botanists</i>	W. R. MILLS	—	
	W. HIRST	Serere.	
	B. J. T. BALDWIN	Kawanda.	New appointment. Arrived 10-1-54.
<i>Curator</i>	I. LANGDALE-BROWN	Kawanda	
<i>Laboratory Technician</i>	C. SANDISON	Entebbe.	
	E. W. HUGHES	Kawanda.	

D. Senior Assistant and Assistant Agricultural Officers

Name	Station	Name	Station
A. Kanya	Bukalasa.	Z. K. Banagajja	Fort Portal.
H. R. Berunga	Mubende.	A. G. Kibulo	Mbale.
Z. H. Kwebiha	Hoima.	J. N. Kimoino	Jinja.
Y. M. Kaidzi	Kampala.	H. W. Muloki	Jinja.
P. Sempa	Bukalasa.	S. L. Takirambude	Lira.
G. L. Kirundu	Kampala.	Z. N. Wanyama	Soroti.
P. M. Sali	U.K. Scholarship.	S. B. Kikule	Serere.
Y. K. Musisi	Kawanda.	J. A. Wandera	Mbale.
H. D. Mubiru	Kawanda.	S. K. Mukasa	Kawanda.
Z. K. Katerega	Masaka.	J. S. Musisi	Serere.
S. M. B. Mutagwanyana	Kampala.	L. M. Kaboha	Jinja.
F. B. Sarulo	Mbale.	D. E. Kawalya	Moroto.
A. K. Mulera	Bukalasa.	J. S. Laker	U.K. Scholarship.
A. A. Kalanzi	Kampala.	F. J. Luswata	Kabale.
F. H. O. M. Zake	Gulu.	P. F. Kunya	Jinja.
T. K. Otim	Mbarara.	S. K. Sengendo	Arua.
J. B. O. Baguma	Jinja.	E. B. Galukande	Mbarara.
M. S. K. Makumbi	Mubende.	N. O. Z. Sakio	Soroti.
Z. K. Sekkide	Kampala.	J. N. Byagagaire	Kabale.
H. G. N. Semambo	Kampala		
J. M. Sekimpe	Kampala		